ATTACHMENT 2

WASTE ANALYSIS PLAN

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LIST OF ACRONYMS

Acronym	Definition
ACS	Agent Collection System
AQS	Agent Quantification System
BRA	Brine Reduction Area
Btu	British Thermal Unit
CAL	Chemical Assessment Laboratory
CCL	Chemical Control Limit for Mustard
CTC	Cutaway Ton Container
DFS	Deactivation Furnace System
DCD	Deseret Chemical Depot
DSHW	Division of Solid and Hazardous Waste
ECR	Explosive Containment Room
EPA	Environmental Protection Agency
GB	Sarin, Isopropyl methylphosphonofluoridate
GC/MS	Gas Chromatography/mass spectrometry
H/HD/HT	Sulfur Mustard[1]/Distilled Sulfur Mustard/Distilled Mustard with 40% bis (2-Chloroethylthioethyl)ester
HDC	Heated Discharge Conveyor
HEPA	High Efficiency Particulate Air
HRA	Hazard Risk Assessment
LIC	Liquid Incinerator
MDB	Munition Demilitarization Building
mg/m^3	Milligrams per cubic meter
MPF	Metal Parts Furnace
MSB	Monitor Support Building
ONC	On-site Container
PAS	Pollution Abatement System
PCB	Polychlorinated Biphenyl Compounds
ppb	Parts per billion
ppm	Parts per million
RCRA	Resource Conservation and Recovery Act
RHA	Residual Handling Area
SDS	Spent Decontamination System
Subtitle C TSDF	Hazardous Waste Treatment, Storage and Disposal Facility
TC	Toxicity Characteristic
TCLP	Toxic Characteristic Leaching Procedure
TDS	Total Dissolved Solids
TMA	Toxic Maintenance Area
TOCDF	Tooele Chemical Agent Disposal Facility
TSCA	Toxic Substance Control Act
TSDF	Treatment, Storage and Disposal Facility
TSS	Total Suspended Solids
UPA	Unpack Area
UPMC	Upper Munitions Corridor
VOC	Volatile Organic Concentration (BB/CC)
VX	O-ethyl-S-[2-diisopropylamino)ethyl] methyl phosphonothiolate
WCL	Waste Control Limit

Note: 1 Sulfur Mustard = Bis(2-Chloroethyl) Sulfide or 2,2'-Dichlorodiethyl Sulfide

2.1. INTRODUCTION

2.1.1. Generators of hazardous waste are required to obtain detailed chemical analyses of wastes they intend to treat, store, or dispose of in order to ensure proper hazardous waste management practices.

2.1.2. This Waste Analysis Plan describes:

2.1.2.1. the physical and chemical analyses the Permittee shall perform before hazardous wastes are stored, treated, or transported off site for further treatment and ultimate disposal,

2.1.2.2. the methods and frequency to be used to collect and analyze samples,

2.1.2.3. the procedures that will be used to ensure the validity of the analytical results, and

2.1.2.4. the basis for generator knowledge.

2.1.2.5. Tables 2-0 and 2-1 presents a summary of this entire waste analysis plan. For each waste stream specified, these tables present the selected analytical parameters and corresponding analytical methods, sampling frequencies, and sampling methods. In addition the tables include either a reference to the unit that will treat each waste stream (for waste to be treated on site) or a reference to the process generating each waste stream (for wastes to be treated and disposed of off site).

2.2. PARAMETERS AND RATIONALE 40 CFR 264.13(b)(1) [R315-8-2.4]

2.2.1. Analyses for Wastes Requiring On-Site Treatment

2.2.1.1. Waste streams included in this section are treated on site in one or more of the four incinerators, or the Brine Reduction Area. Analytical parameters were selected for each waste stream based on previous analytical results obtained for similar waste streams, the homogeneity of the waste and the ability to obtain a representative sample, and/or government manufacturing specifications (in regards to munition energetic components).

2.2.1.2. The Permittee shall determine the hazardous constituents in the waste streams to be treated on site. The Permittee shall also determine the underlying hazardous constituents as applicable in 40 CFR 268.9. For wastes to be treated on site, which are not included in Table 2-0, the Executive Secretary shall be notified of the most appropriate management practices including treatment methods and appropriate waste analyses. This notification shall be in writing and occur within seven days from the time when the Permittee determines a waste has been generated that is not included in Table 2-0. The Executive Secretary will determine if the chosen treatment is acceptable.

2.2.1.3. Chemical Agents GB, VX, HD/H/HT

2.2.1.3.1. Previous analyses of chemical agents have identified agent breakdown products and organic stabilizers (referred to collectively as agent organic content), and metal constituents. Data compiled from these previous analyses have been used to establish expected ranges for agent organic content (see Table 2-A-2) and metal constituents.

2.2.1.3.2. The Permittee shall analyze the chemical agent prior to each agent campaign from bulk containers. Agent samples shall be collected from a representative number of bulk containers agreed upon with the DSHW. The containers shall be sampled and analyzed following an approved sampling and analysis plan.

2.2.1.3.3. At the beginning of each munition or bulk container campaign, agent samples shall be collected using a sampling scheme that is approved by the Executive Secretary. The samples shall be analyzed as specified in Table 2-0.

2.2.1.3.4. Metals included in the HRA list are Aluminum, Antimony, Arsenic, Barium, Beryllium, Boron, Cadmium, Chromium, Cobalt, Copper, Lead, Manganese, Mercury, Nickel, Selenium, Silver, Thallium, Tin, Vanadium, and Zinc.

2.2.1.3.5. The metals analysis associated with the agent waste profile will be accomplished using the methods described in Tables 2-0 and 2-3. The metal analytes quantified will be the HRA metals listed in Paragraph 2.2.1.3.4.

2.2.1.3.6. For each full tank of agent collected in the ACS Tanks, meaning that each agent collection tank will be filled to permitted capacity, one sample shall be collected and analyzed for HRA metals. Every fifth full tank of agent shall be analyzed for agent organic content and density.

2.2.1.3.7. The metals analysis associated with the agent samples collected in compliance with Paragraph 2.2.1.3.6. may be performed using either the site specific or the SW-846 methods described in Tables 2-0 and 2-3. Analytes quantified by the SW-846 methods shall be those HRA metals listed in paragraph 2.2.1.3.4.

2.2.1.3.8. Reserved.

2.2.1.3.9. Based on the results of the agent sampling and analytical, agent feed rates to the incinerators shall be adjusted, as necessary, to ensure continued compliance with the metal feed rate limits.

2.2.1.3.10. For each agent organic analysis and metals analysis, a summary of the results shall be submitted to the Executive Secretary monthly.

2.2.1.3.11. Appendix A of this waste analysis plan contains the following information regarding the chemical agents to be incinerated at the TOCDF:

2.2.1.3.11.1. Table 2-A-1: Physical Properties of Chemical Agent (as a pure substance)

2.2.1.3.11.2. Table 2-A-2: Chemical Agent Composition

2.2.1.4. Spent Decontamination Solutions

2.2.1.4.1. Spent decontamination solutions treated on site shall be treated in the primary or secondary chambers of the LICs.

2.2.1.4.2. Spent decontamination solution collected in SDS-TANK-101, SDS-TANK-102, or SDS-TANK-103 shall be sampled and analyzed. Spent decontamination solutions shall be analyzed for chemical agent concentration, corrosivity (pH), specific gravity, HRA metals, explosives, and screened for organics.

2.2.1.4.2.1. The parameters of agent concentration, pH, specific gravity, and the organic screen shall be determined for each tank of spent decontamination solution processed. The results shall be available prior to incineration.

2.2.1.4.2.2. Confirmatory analyses for HRA metals and explosives in spent decontamination solutions shall be performed quarterly.

2.2.1.4.2.3. The sampling and analyses of spent decontamination solutions for the purpose of demonstrating compliance with Subpart CC regulations shall be performed as described in Section 2.10 of this attachment.

2.2.1.4.3. If results of the organic screen show that the spent decontamination solution contains organics in excess of five percent, the tank of spent decontamination solution shall be analyzed per Table 2-0. The Executive Secretary shall be notified prior to treatment of the solution.

2.2.1.4.4. If chemical agent is detected above the Waste Control Limit (WCL) (i.e., 20 parts per billion (ppb) for GB, 20 ppb for VX, and 200 ppb for H/HD/HT), additional decontamination solution shall be added to the tank, the contents of the tank shall be recirculated (i.e., mixed), and another sample shall be analyzed for agent. This procedure shall be repeated until the chemical agent concentration is below the limits specified above.

2.2.1.5. <u>Agent Collection System (ACS) & Agent Quantification System (AQS) Maintenance Residues</u>

2.2.1.5.1. The chemical agent contaminated debris listed in Table 2-4, and sludges generated from the maintenance of the ACS and AQS equipment located in the Munitions Demilitarization Building (MDB), but outside the Explosive Containment Rooms (ECRs), can be incinerated in the Metal Parts Furnace (MPF).

2.2.1.5.1.1. ACS tank bottoms shall be characterized prior to treatment in the MPF. Samples shall be analyzed for HRA metals and agent concentration.

2.2.1.5.2. Collected ACS/AQS maintenance residues shall be weighed and characterized prior to incineration to ensure feed rates established for the MPF are not exceeded. The Operating Record shall include a detailed description of the residues fed to the MPF.

2.2.1.5.3. ACS/AQS maintenance residues shall be properly managed prior to treatment in the MPF.

2.2.1.6. <u>Metallic Chemical Agent Contaminated Debris</u>

2.2.1.6.1. Discarded components of MDB process equipment, discarded Pre-filters, High Efficiency Particulate Air (HEPA) filters, and carbon filter trays (from which all carbon has been removed) associated with the MDB and CAL filter systems, discarded chemical munition overpacks, and discarded tools used inside the MDB may be treated by incineration in the MPF to remove chemical agent surface contamination. The selection of wastes to be treated in the MPF (other than drained munitions/bulk containers) is based on the potential of the surface of the waste to have been exposed to chemical agent. Table 2-4 is a list of these allowable wastes.

2.2.1.6.2. The physical state of these wastes (i.e., debris) prevents the collection of a representative sample. All wastes included in this category are described by the Utah Hazardous Waste code P999. Other waste codes may apply based on generator knowledge.

2.2.1.6.3. Wastes included in this category shall be placed onto MPF burn trays or thermally treated ton containers that have been cut in half (cutaway ton containers or CTC). All wastes shall be weighed and characterized prior to being treated in the MPF to ensure compliance with this Permit. The Operating Record shall include a detailed description of the residues fed to the MPF in each burn tray or CTC.

2.2.1.6.4. Metallic chemical agent contaminated debris shall be properly managed prior to treatment in the MPF.

2.2.1.7. Drained Bulk Containers & Projectiles with Agent Residue

2.2.1.7.1. Drained bulk containers and projectiles with chemical agent residue (heel) shall be treated in the MPF. Previous analytical results show some of the chemical agent to contain concentrations of metals. In addition, the paints used on the containers and projectiles have metal-containing pigments.

2.2.1.7.2. The chemical agents and item surface coatings (i.e., paint) are both organic matrices containing metal constituents. Metal constituents contained in organic matrices are referred to as non-embedded metals. Non-embedded metals may potentially volatilize during incineration.

2.2.1.7.3. Appendix B contains the following tables regarding the metals associated with each type of chemical agent munition and bulk container to be treated at the TOCDF:

2.2.1.7.3.1. Table 2-B-1: Metals in Munitions (presents by munition or bulk container, the total metal loading for non-embedded metals whose emission rates are regulated by this Permit)

2.2.1.7.3.2. Table 2-B-2: Metals in Munitions (presents, by munition or bulk container, the total metal loading for non-embedded metals whose emission rates are considered in the TOCDF HRA)

2.2.1.7.4. Data included in these tables can be used to determine the quantity (and associated feed rate) of non-embedded metals fed to the incinerator.

2.2.1.8. Energetic Munition Components

2.2.1.8.1. Energetic munition components shall be incinerated in the DFS.

2.2.1.8.2. The Permittee may use generator knowledge to determine the type and amount of explosive and propellant being fed to the DFS.

2.2.1.8.3. Appendix C contains the following tables pertaining to explosive/propellant and agent fill weights and compositions:

2.2.1.8.3.1. Table 2-C-1: Energetic/Agent Nominal Weight for Chemical Agent Munitions and Bulk Containers

2.2.1.8.3.2. Table 2-C-2: Composition of Reactive Material in Munitions

2.2.1.8.4. Explosive and propellant formulations are organic matrices containing metal constituents. The metals contained in these formulations will potentially volatilize during incineration (i.e., the metals are non-embedded).

2.2.1.8.5. The quantity of each metal identified in Table 2-C-2 has been incorporated into Tables 2-B-1 and 2-B-2 found in Appendix B which present the total non-embedded metals for each munition and bulk container type to be treated at the TOCDF.

2.2.1.9. ECR Maintenance Residues

2.2.1.9.1. Maintenance performed on the demilitarization machines, Agent Quantification System (AQS) components, and Agent Collection System (ACS) components that are located in the Explosive Containment Rooms (ECR) will generate waste residues. Dry residues and sludge shall be placed into paper buckets prior to being fed to the DFS. A list of the ECR Maintenance Residues is provided in Table 2-2a.

TABLE 2-2a: Contaminated Waste	
ECR Maintenance Residues Waste Stream	Allowable Waste Codes(s)
• Chemical agent liquids, sludges and solids from AQS/ACS filters • Filter elements and bags • Munition fragments (fiberglass, metal and explosives) • Dust, dirt, debris, ECR sump sludge • Munition components/fragments (i.e., burster fragments, supplementary charges, spacers, support cups, lifting lugs, and fuze adaptors that fall onto the turntable or floor) • Clean-up material (e.g., rags, absorbent pads) • Cotton goods (e.g., coveralls, mop heads) • ECR Sump strainers • Unserviceable hand tools and metal hardware (e.g., nuts, bolts, washers) • Burlap bags • Mine components that fall onto the Mine Machine or floor	P999, F999, D002, D003, D004, D005, D006, D007, D008, D009, D010

2.2.1.9.2. The Permittee shall decontaminate the unserviceable hand tools and metal hardware identified in Table 2-2a and process them in the MPF. If the explosive residue remains on the tools after decontamination, the metal tools and hardware shall be processed in the DFS. The maintenance residues in Table 2-2a may be contaminated with small amounts of spent decontamination solution, agent, hydraulic fluid, or lubricating fluid. Explosives-contaminated rags generated by personnel wiping explosive residues from reject munitions in the UPMC or ECV shall be fed to the DFS.

2.2.1.9.3. ECR maintenance residues shall be weighed and properly identified as to the origin and physical characteristics prior to incineration to ensure the DFS feed rate limits are not exceeded.

2.2.1.9.4. ECR maintenance residues are typically discarded items having agent surface contamination, explosive surface contamination, or both. Operation of equipment in the ECRs can generate explosive powders. ECR maintenance residues composed of powdered explosive and munitions components shall be managed separately from other ECR maintenance residues. The feed rate of ECR maintenance residues composed of explosive powders and munition components shall be limited to 3.6 pounds per drop with an internal kiln spacing of one flight between successive drops. The hourly feed rate is specified in Modules V (Long-Term Incineration) and VI (Short-Term Incineration).

2.2.1.9.5. ECR maintenance wastes charged to the DFS that do not contain explosive components or containers of explosive powder are assumed to consist entirely of agent.

2.2.1.10. Spent Activated Carbon

2.2.1.10.1. Prior to completion of closure of the TOCDF, the Permittee shall treat all site-generated carbon in the Carbon Micronization System (CMS). Prior to treatment in the CMS, a successful performance test shall be conducted based on an approved test plan.

2.2.1.10.2. The spent carbon shall be placed into permitted storage areas designated to store waste contaminated with the same type of chemical agent until the results of a performance test are approved by the Executive Secretary.

2.2.1.11. Agent Contaminated Dunnage

2.2.1.11.1. Dunnage meeting the following definition shall be characterized as P999 hazardous waste. Agent contaminated dunnage is defined as:

2.2.1.11.1.1. All dunnage held within an ONC or munitions overpack that is found to contain leaking munition(s) as evident by agent monitoring results of the air within the sealed ONC or overpack having a concentration of 0.2 TWA or above, or

2.2.1.11.1.2. Dunnage that contacted leaking munitions or is contaminated with liquid agent, or

2.2.1.11.1.3. Dunnage that has been sampled and the analytical results of an extract prepared from a representative sample have been found to contain agent at concentrations equal to or greater than 20 ppb for GB and VX, and 200 ppb of H/HD/HT.

2.2.1.11.2. Dunnage characterized as P999 hazardous waste shall be treated in the MPF based on completion of a successful performance test in accordance with an approved test plan.

2.2.1.11.3. Reserved.

2.2.1.11.4. Within 180 days of the effective date of this Permit, the Permittee shall submit a performance test plan for dunnage management which is sufficient to support completion of the treatment and disposal of dunnage waste streams.

2.2.1.11.5. Dunnage associated with M55 rockets will additionally be analyzed for PCBs to demonstrate that contact with PCB-regulated items (i.e., the M55 rocket shipping/firing tubes) did not cause cross-contamination of the dunnage.

2.2.1.11.6. The dunnage shall be placed into permitted storage areas designated to store waste contaminated with the same type of chemical agent until a dunnage management plan is approved by the Executive Secretary.

2.2.1.12. Non-Metallic Agent-Contaminated Debris

2.2.1.12.1. Non-metallic agent-contaminated debris shall be characterized as P999 (and all other applicable waste codes) and placed into permitted storage. Examples of agent-contaminated debris are discarded butyl rubber personnel protective equipment (PPE) which has contacted liquid or vapor chemical agent, discarded MDB maintenance equipment which has contacted liquid or vapor chemical agent, and Chemical Assessment Laboratory (CAL) generated solid debris.

2.2.1.12.2. Within 180 days of the effective date of this Permit, the Permittee shall submit a performance test plan for non-metallic agent-contaminated debris management which is sufficient to support completion of the treatment and disposal of debris waste streams.

2.2.1.12.3. The debris shall be placed into permitted storage areas designated to store waste contaminated with the same type of chemical agent as the debris to be stored until a non-metallic agent-contaminated debris management plan is approved by the Executive Secretary.

2.2.1.13. Personal Protective Equipment (PPE) Respirator Carbon Filter Canisters

2.2.1.13.1. PPE respirator carbon filter canisters shall be managed in accordance with the carbon management plan described in Section 2.2.1.10.

2.2.1.14. Spent Scrubber Brines

2.2.1.14.1. Pollution Abatement System (PAS) scrubber brines are collected in one of four Brine Reduction Area (BRA) surge tanks. Scrubber brines collected in the BRA tanks shall be treated on site in the BRA evaporators and drum dryers or transferred to tankers and shipped off site to a Subtitle C Treatment, Storage and Disposal Facility (TSDF).

2.2.1.14.2. Each BRA tank of scrubber brines shall be analyzed for chemical agent concentration, corrosivity (pH), and specific gravity. On a monthly basis or each munitions campaign change, whichever is sooner, the Permittee shall sample and analyze a sample of scrubber brines taken from each BRA tank for HRA metals and total organics.

2.2.1.14.3. Scrubber brines generated from the treatment of M55 rockets shall additionally be analyzed for PCBs. Brines having more than three parts per billion (ppb) PCB are a TSCA regulated waste and will be managed at an approved TSCA TSDF.

2.2.1.14.4. The brine analysis shall be reported to the Executive Secretary if the result of the corrosivity analysis conducted on each batch of brines is found to be below a pH of 7.0. An oral notification shall occur within one day of the validation of the analysis. This notification will be followed up in writing within fifteen days from the date of validation.

2.2.1.14.5. Spent scrubber brines shall only be treated in the BRA if the agent concentration in the brines is found to be below 20 ppb for GB and VX, and 200 ppb for H/HD/HT. If the agent concentration is greater than these values, the Permittee shall notify the Executive Secretary and concurrence shall be received before further treatment.

2.2.1.15. Miscellaneous Agent-Contaminated and Non-Agent-Contaminated Liquid Wastes

2.2.1.15.1. Agent-contaminated hydraulic fluid and lubricating oil generated in the MDB shall be either containerized and placed into permitted storage or containerized and transferred to the ACS tanks (e.g., via BDS) and subsequently treated in the LIC primary chambers. Before transfer to the ACS tanks, the container(s) shall be weighed (e.g., via BDS load cells or a calibrated scale in the TMA) and the contents shall be sampled and analyzed (ref: Table 2-0). The corresponding results shall be documented in the Operating Record. (Agent-contaminated shall be defined as being at or above 20 ppb for GB and VX, and 200 ppb for H/HD/HT.)

2.2.1.15.2. Agent-contaminated hydraulic fluid and lubricating oil may also be pumped to the ACS tanks, via the SDS collection system, and processed in the LIC primary chambers. A sample shall be collected from the spent decontamination tank before it is transferred to the ACS tank (ref: Table 2-0) for analysis.

2.2.1.15.3. Before treatment in the LICs, the samples described above shall be analyzed for HRA metals. The analytical results shall be used to ensure that LIC metal feed rate limitations are not exceeded. Additionally, the associated manufacturer information (e.g., MSDSs, product data sheets, etc.) shall be reviewed to identify organic hazardous constituents having a heat of combustion less than tetrachloroethylene (i.e., 2,141 BTU/lb). If any of these organic hazardous constituents are present, the waste shall be placed into permitted storage until an appropriate management option is identified by the Permittee and approved by the Executive Secretary. The results of the above analyses shall be documented in the Operating Record.

2.2.1.15.4. Non-agent contaminated hydraulic fluid and lubricating oil generated in the MDB shall be containerized and managed properly or transferred to the ACS tanks (e.g., via BDS) and subsequently treated in the LIC primary chambers. Before transfer to the ACS tanks, the container(s) shall be weighed (e.g., via BDS load cells or a calibrated scale in the TMA) and the contents shall be sampled and analyzed (ref: Table 2-0). The corresponding results shall be documented in the Operating Record.

2.2.1.15.5. Non-agent-contaminated hydraulic fluid and lubricating oil may also be pumped to the ACS tanks, via the SDS collection system, and processed in the LIC primary chambers. A sample shall be collected from the spent decontamination tank before it is transferred to the ACS tank (ref: Table 2-0) for analysis.

2.2.1.16. Bulk Containers Requiring Special Handling (GB Only)

2.2.1.16.1. GB agent bulk containers with a Portable Isotopic Neutron Spectroscopy (PINS) ratio less than or equal to 5.0 must be pretreated to remove the heavy metal containing solids before the drained and rinsed bulk containers are fed to the MPF and shipped off site in accordance with procedures specified in this attachment. This special handling rinse process is described in Attachment 14.

2.2.1.16.2. The final volume of rinse water associated with each bulk container rinsed out by the special handling process will be sampled and analyzed for HRA metals (excluding Aluminum, Beryllium, and Boron).

2.2.1.16.3. Metal concentrations in the final rinse shall be less than or equal to the values listed in Table 2-2c below. The rinse sequence includes, at a minimum, a decontamination rinse, a process water rinse, a weak acid rinse, and a process water rinse. As a minimum, the acid rinse and final process water rinse will be repeated if the final rinse metals concentrations specified in Table 2-2c are not met.

Table 2-2c
Special Handling Bulk Container
Final Rinse Metal Concentration Limits

Metal	Final Rinse Metals Concentration[1] (mg/Kg)	Metal	Final Rinse Metals Concentration[1] (mg/Kg)
Arsenic	2962	Mercury	22.6
Selenium	139		

[1] The amount of final rinse volume that will remain behind after the final drain step and fed to the MPF has been determined to be 0.84 gallons, or 7 pounds.

2.2.1.16.4. If the metals concentrations specified in Table 2-2c cannot be met after three acid rinses, the bulk container shall be managed as described in Section 2.2.2.30.

2.2.2. **Analyses for Wastes Requiring Off-Site Treatment & Disposal**

2.2.2.1. The waste streams included in this section shall be transported off site for further treatment and ultimate disposal. The analytical parameters were selected based on process knowledge, TOCDF analytical data, and Land Disposal Restriction Notification requirements. The extraction method that will be used to determine Toxicity Characteristic parameter concentrations will be the Toxicity Characteristic Leaching Procedure (SW-846 Method 1311).

2.2.2.1.1. All waste streams included in this section (with the exception of the dunnage generated in the UPA, treated GB scrap metal, and liquids generated in SUMP 110) shall be characterized as F999 hazardous waste. Treated GB scrap metal is defined as metal from bulk containers, projectiles, and mortar rounds which has undergone thermal decontamination in the MPF under normal operating parameters and has no residue remaining internally or externally on the scrap metal. Treated GB scrap metal shall be managed in accordance with Section 2.2.2.7.6 of this attachment. Each shipment of F999 waste transported off site shall be accompanied by a hazardous waste manifest.

2.2.2.1.2. The Permittee shall determine the hazardous constituents in the waste streams to be treated off site. The Permittee shall also determine the underlying hazardous constituents as applicable in 40 CFR 268.9 and give proper notification with the hazardous waste manifest.

2.2.2.2. LIC Slag

2.2.2.2.1. The incineration of chemical agent and spent decontamination solutions in the LICs cause the generation of a “glass like” slag waste stream. Slag (in a molten state) accumulates in the secondary chambers of the LICs.

2.2.2.2.2. Each batch of slag shall be removed by tapping the slag extension of the secondary chamber and draining the molten slag into insulated drums or by chipping the solidified slag and placing the slag into containers. Each LIC secondary chamber is equipped with a view port that allows the operator to visually determine the slag level within the secondary chamber. The slag shall be removed before the slag level reaches the top of the view port.

2.2.2.2.3. Each batch of LIC slag generated shall be analyzed for TCLP metals after each re-bricking until the metal concentrations drop below the regulatory limits.

2.2.2.3. Treated M55 Rocket Parts/Fiberglass/Ash

2.2.2.3.1. Ash and debris collected at the DFS Heated Discharge Conveyor (HDC) output is generated during the treatment of M55 rockets and shall be analyzed for the chemical agent concentration, TCLP metals, TCLP organics, and PCBs. If analytical results demonstrate this waste to be Toxicity Characteristic for organics, this waste stream shall additionally be analyzed for dioxins/furans and explosives.

2.2.2.3.2. Solid residues resulting from the treatment of M55 rockets having more than two parts per million (ppm) PCB are a TSCA regulated waste and shall be managed at an approved TSCA TSDF.

2.2.2.3.3. The detoxification of waste residues exiting the DFS is maintained during upset conditions by features built into the control logic of the incinerator. When Automatic Waste Feed Cut-Offs (AWFCOs) are activated, the process control software causes the kiln to oscillate and the HDC to stop, when necessary, to prevent the discharge of waste residues until operating parameters associated with the kiln and HDC temperature and motion are restored. The kiln continues to rotate forward and HDC motion is maintained when AWFCOs that are not related to kiln and HDC temperatures (or motion) are activated. Table D-7-2 in Attachment 19 (Instrumentation and Waste Feed Cut-off Tables) shows the different AWFCO scenarios for the kiln and HDC.

2.2.2.3.4. In the event that waste is discharged from the HDC during an upset condition, the Permittee shall notify the Executive Secretary; document the circumstances in the Operating Record; analyze one sample taken from each HDC waste bin generated during the upset condition for agent concentration; and analyze a composite sample for PCBs (if PCBs are included in the DFS feed stream).

2.2.2.4. Treated Burster Casings/Fuse Bodies/Ash

2.2.2.4.1. During the projectile campaigns, residues collected at the DFS HDC output will consist of ash, empty burster casings and fuse bodies. The bursters are removed in the ECRs leaving the projectile's burster well intact and the projectile's agent cavity unopened. Projectile agent cavities are opened in the Munition Processing Bay (MPB) just prior to the agent draining process step.

2.2.2.4.2. Ash and debris generated from the incineration of bursters and fuses removed from projectiles/mortars shall be analyzed for agent concentration, TCLP metals, and TCLP organics.

2.2.2.5. Treated Mines/Fuse Bodies/Ash

2.2.2.5.1. VX mines shall be punched and drained of their chemical agent fill in ECR B. The drained mine body and the mine's associated energetic components shall then be fed to the DFS. During the VX mine campaign, DFS HDC residues will consist of mine bodies, fuse bodies, and ash.

2.2.2.5.2. The ash portion of this waste stream shall be analyzed for chemical agent concentration, TCLP metals, and TCLP organics.

2.2.2.5.3. In the event that waste is discharged from the HDC during an upset condition, the Permittee shall notify the Executive Secretary; document the circumstances in the Operating Record; and analyze one sample taken from each HDC waste bin generated during the upset condition for agent concentration.

2.2.2.6. DFS Cyclone Residues

2.2.2.6.1. DFS cyclone residues shall be analyzed per Table 2-1 for the parameters of chemical agent concentration, TCLP metals, and TCLP organics. If analytical results demonstrate this waste to be Toxicity Characteristic for organics, this waste stream shall additionally be analyzed for dioxins/furans and explosives.

2.2.2.6.2. DFS cyclone residues generated during M55 rocket processing shall additionally be analyzed for PCBs. Solid residues resulting from the treatment of M55 rockets having more than two ppm PCB are a TSCA regulated waste and shall be managed at an approved TSCA TSDF.

2.2.2.6.3. DFS cyclone residues having a chemical agent concentration below 20 parts per billion (ppb) for GB and VX, and 200 ppb for H/HD/HT, shall be transported to an off-site Subtitle C TSDF.

2.2.2.6.4. DFS cyclone residues having an agent concentration equal to or greater than 20 ppb for GB and VX, and 200 ppb for H/HD/HT shall be placed into permitted container storage until a treatment method is approved by the Executive Secretary.

2.2.2.7. Treated Bulk Containers/Projectiles/Mortar Rounds (Scrap Metal)

2.2.2.7.1. Each burn tray exiting the MPF undergoes an agent assessment to ensure adequate thermal treatment. The presence of chemical agent is determined by an Automatic Continuous Air Monitoring System (ACAMS) located at the MPF discharge airlock. If chemical agent is detected above 0.2 CCL/TWA, the munitions/bulk containers are moved back into the MPF to undergo further thermal treatment. Munitions/bulk containers will be processed through the discharge airlock in accordance with Module V, VI, and Attachment 22 using either high temperature or low temperature monitoring of the discharge airlock.

2.2.2.7.2. The MPF is designed with double-door airlock systems located on both the charge and discharge end of the primary combustion chamber (PCC). These systems prevent PCC combustion gases and agent vapors from being discharged to the MDB or the atmosphere when burn trays are charged and discharged respectively.

2.2.2.7.3. The MPF primary combustion chamber is divided into two or three zones, depending upon the type of munition processed. Treatment through the MPF requires that each burn tray charge remain in each zone for a preset period of time as specified in Module V. Spray Tanks and mine drums must be processed using low temperature monitoring until a monitoring plan, specific to Spray Tanks and mine drums, has been approved by the Executive Secretary. When a burn tray advances to the discharge airlock, Zone 3 (or Zone 2 if the MPF is in two-zone operation) is empty for a minimum of 31 minutes for projectiles and 42 minutes for ton containers while the ACAMS in the discharge airlock is used to monitor the treated munition(s). Spray Tanks and mine drums times must be approved by the Executive Secretary.

2.2.2.7.4. While in the discharge air lock, the contents of the burn tray are monitored for the presence of chemical agents using ACAMS. The burn tray remains in the MPF discharge airlock for the ACAMS to monitor two complete cycles.

2.2.2.7.5. If chemical agent is detected at or above the action level of 0.2 TWA/CCL, the burn tray in the MPF discharge airlock is moved back into Zone 3 (or Zone 2 if the MPF is in a two-zone operation) for additional processing. If no agent is detected, the burn tray exits the MPF discharge airlock by being advanced to the MPF cool-down conveyor. Flaming or smoking munitions/bulk containers or waste trays shall be placed back into the discharge airlock for additional processing.

2.2.2.7.6. Treated GB scrap metal shall be sent off site and shall be: (1) managed as scrap metal and recycled exclusively by smelting; or (2) managed as a hazardous waste and disposed at an approved, off-site Subtitle C TSDF. For disposal, manifest requirements shall be followed. F999 scrap metal shall be managed as a hazardous waste and disposed at an approved, off-site Subtitle C TSDF.

2.2.2.7.7. VX and Mustard scrap metal shall be managed as an F999 waste and be transported with a hazardous waste manifest describing waste as an F999 Utah listed hazardous waste until verification testing has been accepted. Before shipment of GB scrap metal, residue in the interior and on the exterior of the scrap metal shall be removed (e.g., vacuumed) and visually verified as clean. The residue removed shall be analyzed and managed according to the requirements described below for the MPF Burn Tray and CTC residues (ref: section 2.2.2.9). Any GB treated scrap metal that contains residue that cannot be removed, shall be considered a F999 waste and the requirements specified in paragraph 2.2.2.7.6(2) shall be followed.

2.2.2.8. <u>MPF Treated Debris</u>

2.2.2.8.1. Pre-filters, HEPA filters, carbon filter trays (from which the carbon was removed prior to treatment in the MPF), munition overpacks, shipping containers, process equipment, and tools are treated in the MPF to remove surface contamination.

2.2.2.8.2. Each burn tray or CTC exiting the MPF is analyzed for chemical agent as described in Attachment 2 (Waste Analysis Plan) and Attachment 22 (Agent Monitoring Plan).

2.2.2.8.3. This MPF treated debris waste stream shall be managed separately from the scrap metal waste stream and shall not be recycled, with the exception of the following miscellaneous metal wastes; munition overpacks, piping, conveyors, drain probes, and shear blades. Miscellaneous metal wastes may be treated as scrap metal and recycled in accordance with paragraphs 2.2.2.7.6 and 2.2.2.7.7.

2.2.2.9. MPF Burn Tray and Cutaway Ton Container Residues

2.2.2.9.1. MPF burn tray and CTC residues will be comprised primarily of incinerated paint flake residues and treated ACS/AQS maintenance residues. Residues shall be removed from each tray before the tray is routed back through the MDB. The burn tray residues are swept/vacuumed from the burn tray and placed into a hazardous waste container.

2.2.2.9.2. MPF burn tray residues shall be analyzed for chemical agent concentration, TCLP metals, and TCLP organics.

2.2.2.9.3. The residue waste stream resulting from the MPF incineration treatment of the agent contaminated material identified in Table 2-4 shall be managed separately from the munitions metal residues and shall not be recycled. This waste stream shall be shipped to an approved hazardous waste facility for disposal.

2.2.2.10. Spray Tank Nose Cones

2.2.2.10.1. After treatment in the MPF, Spray Tank nose cones will be removed from the Spray Tank body. The nose cones shall be properly managed at an off-site Subtitle C TSDF with the appropriate waste codes (e.g., F999, D008, other waste codes that may apply.)

2.2.2.11. Incinerator Refractory

2.2.2.11.1. Upon change out, the discarded refractory lining of the incinerator primary and secondary chambers shall be analyzed for TCLP metals and properly managed.

2.2.2.12. PAS Residues

2.2.2.12.1. PAS residues are comprised of scrubber brine precipitate and filter elements. The precipitate is collected in the bottom of the PAS process vessels (i.e., the quench towers, packed bed scrubbers, and demister vessels), and the PAS brine filters.

2.2.2.12.2. The PAS residues are of a similar composition to that of the scrubber brine salts (the waste stream generated from drying the scrubber brines in the BRA evaporators and drum dryers).

2.2.2.12.3. The PAS residues shall be analyzed for the parameters of chemical agent concentration, corrosivity (pH), free liquids, TCLP metals, and TCLP organics.

2.2.2.12.4. DFS PAS residues generated during the processing of M55 rockets shall also be analyzed for PCBs. Solid residues having more than two ppm PCB are a TSCA-regulated waste and shall be managed at an approved TSCA TSDF.

2.2.2.13. Spent Scrubber Brines

2.2.2.13.1. Scrubber brines are removed from the PAS as they are generated by the process control equipment. Spent scrubber brines shall be stored in BRA-TANK-101, BRA-TANK-102, BRA-TANK-201, and BRA-TANK-202.

2.2.2.13.2. In the event the on-site treatment capacity of the BRA is exceeded because the BRA is inoperable or the scrubber brine generation exceeds the capacity of the BRA, the Permittee shall ship the excess scrubber brines to an off-site TSDF for further treatment and ultimate disposal.

2.2.2.13.3. Spent scrubber brines from each BRA tank to be transferred off site for further treatment and ultimate disposal shall be analyzed for chemical agent concentration, corrosivity (pH) and specific gravity.

2.2.2.13.4. On a monthly basis or each munitions campaign change, whichever is sooner, a composite sample comprised of a sample from each BRA Tank shall be analyzed for TC metals and TC organics. This analysis is to confirm the current waste profile for scrubber brines. The brine from which the confirmatory sample was taken may be shipped off site under the current brine waste profile.

2.2.2.13.5. For Subpart CC VOC demonstration compliance, spent scrubber brines shall be sampled as the tank is being filled as required in Table 2-1 and specified by Section 2.10.

2.2.2.13.6. Spent scrubber brines shall only be shipped off site for further treatment and ultimate disposal if the agent concentration in the brines is below 20 ppb for GB and VX, and 200 ppb for H/HD/HT.

2.2.2.13.7. Spent scrubber brines transferred off site shall also be analyzed for PCBs, if the brines are generated from the processing of M55 rockets. Scrubber brines having more than three ppb PCB are a TSCA-regulated waste and shall be managed at an approved TSCA TSDF.

2.2.2.14. SDS Tank Sludges

2.2.2.14.1. Filters associated with the SDS tanks collect solids that have precipitated out of spent decontamination solution. The sludge removed from the filters associated with the SDS tanks shall be analyzed for chemical agent, corrosivity (pH), free liquids, explosives, TCLP metals, and TCLP organics.

2.2.2.14.2. SDS tank sludges shall only be shipped off site for further treatment and ultimate disposal if the agent concentration in the sludges is below 20 ppb for GB and VX, and 200 ppb for H/HD/HT. If the agent concentration is found to be greater than or equal to these values, decontamination solution shall be added to the accumulation container and the analysis for chemical agent, pH, and free liquids shall be repeated.

2.2.2.14.3. Sludges from SDS sumps located outside of the ECRs shall be managed in accordance with Paragraphs 2.2.2.14.1 and 2.2.2.14.2.

2.2.2.15. BRA Tank Sludges

2.2.2.15.1. Between agent campaigns, the scrubber brine sludge which has collected in the BRA tanks is removed. During scheduled maintenance of a BRA tank, scrubber brine sludge may be removed.

2.2.2.15.2. BRA tank sludges shall be analyzed for agent concentration, pH, free liquids, TCLP metals, and TCLP organics.

2.2.2.15.3. BRA tank sludges generated during M55 rocket campaigns shall be analyzed for PCBs.

2.2.2.15.4. Waste residues containing liquids having a PCB concentration greater than three ppb PCB are a TSCA-regulated waste and shall be managed at an approved TSCA TSDF.

2.2.2.16. PAS Demister Candle Sleeves

2.2.2.16.1. Prior to shipment, the demister candle sleeves from each PAS shall be analyzed for chemical agent concentration, TCLP metals and TCLP organics.

2.2.2.16.2. Demister candle sleeves generated by the DFS PAS during the processing of M55 rockets shall be analyzed for PCBs. Demister candle sleeves having more than two ppm PCB are a TSCA-regulated waste and shall be managed at an approved TSCA TSDF.

2.2.2.17. Scrubber Brine Salts

2.2.2.17.1. Scrubber brine salts are generated by concentrating the brines in the BRA evaporators and by evaporating the concentrated brine in the BRA drum dryers.

2.2.2.17.2. Scrubber brine salts shall be analyzed for chemical agent concentration, pH, free liquids, TCLP metals and TCLP organics.

2.2.2.17.3. Scrubber brine salts generated during the processing of M55 rockets shall be analyzed for PCBs. Solid residues having more than two ppm PCBs are a TSCA-regulated waste and shall be managed at an approved TSCA TSDF.

2.2.2.18. BRA PAS Knockout Box Residues

2.2.2.18.1. A component of the BRA PAS is a knockout box. The function of this equipment is to remove excess moisture from the exhaust streams of the BRA drum dryers and evaporators. The knockout box is located in the same room as the BRA evaporators and drum dryers.

2.2.2.18.2. Residues from the knockout box shall be analyzed for chemical agent concentration, pH, free liquids, TCLP metals, and TCLP organics. Residues generated during the processing of M55 rockets shall also be analyzed for PCBs.

2.2.2.19. BRA PAS Baghouse Residues

2.2.2.19.1. BRA PAS baghouse residues shall be analyzed for chemical agent concentration, pH, free liquids, TCLP metals, and TCLP organics. The residues shall be properly managed as hazardous waste. Residues generated during the processing of M55 rockets shall also be analyzed for PCBs.

2.2.2.20. Dunnage Generated in the Unpack Area (UPA)

2.2.2.20.1. The initial waste characterization of dunnage received in the UPA is based on a determination by Area 10 personnel.

2.2.2.20.2. UPA personnel shall use ONC/overpack agent monitoring to determine if dunnage has become contaminated during transport to TOCDF. Dunnage present in ONCs/overpacks having agent monitoring results of 0.2 TWA or greater shall be characterized as P999 hazardous waste and managed as specified in paragraph 2.2.1.11.2.

2.2.2.20.3. Samples of dunnage (that have not been declared hazardous waste by Area 10) shall be taken in accordance with Table 2-1 from ONCs/overpacks that monitor below 0.2 TWA and do not contain leaking munitions. If an analysis of representative samples of dunnage shows agent concentrations at or above the WCL, the dunnage shall be characterized as P999 hazardous waste and managed as specified in paragraph 2.2.1.11.2. If the agent analytical results show the agent concentration is below the WCL and exhibits no hazardous waste characteristics or listings, the dunnage is not considered a listed hazardous waste.

2.2.2.21. DPE Suits

2.2.2.21.1. Demilitarization Protective Ensemble (DPE) suits are encapsulating, supplied air PPE worn by personnel required to enter areas in the MDB where agent liquid or vapors are known to exist. Each suit is decontaminated before the "Entrant" is removed from the suit. The decontaminated suits are bagged in containers (typically plastic bags, with two to three suits per bag).

2.2.2.21.2. Discarded DPE Suits shall be characterized as P999 or F999 hazardous waste based on generator knowledge, agent monitoring, and sample analytical results.

2.2.2.21.3. DPE Suits that are not monitored for agent shall be characterized as P999 hazardous waste and managed as specified in paragraph 2.2.2.21.7.

2.2.2.21.4. DPE Suits may be characterized as F999 hazardous waste if the agent monitoring results of the volume of air within the suit's container shows an agent concentration less than 0.20 TWA/CCL, and the requirements specified in paragraph 2.2.2.21.9 through 2.2.2.21.10 are met.

2.2.2.21.5. Containers of DPE suits having agent monitoring results equal to or greater than 0.20 TWA/CCL shall be characterized as P999 hazardous waste and managed as specified in paragraph 2.2.2.21.7.

2.2.2.21.6. DPE suit samples shall be collected from the section of the suit most likely to become contaminated while being worn by the wearer rubbing up against agent-contaminated equipment, that is, the front-lower mid-section of the suit. Samples of DPE suits passing the agent monitoring shall be sampled and analyzed at a frequency of twenty percent of the DPE suits or one sample per container, whichever is greater.

2.2.2.21.7. DPE suits to be managed as a P999 listed hazardous waste shall be placed into permitted container storage or treated at the CAMDS Material Decontamination Chamber-2 (MDC-2) in accordance with the CAMDS Hazardous Waste Permit, or both. The treated DPE suits shall be managed off site as an F999 hazardous waste if the agent concentration is below 20 ppb for GB and VX and 200 ppb for mustard (other waste codes may apply).

2.2.2.21.8. DPE suits that have been treated in the MDC-2 at CAMDS shall be sampled and analyzed, and shipped off site in accordance with the CAMDS Hazardous Waste Permit or may be returned to the Permittee and managed as F999 waste if analysis of an extract made from samples of the DPE suits demonstrates that agent in the extract is below 20 ppb for GB and VX, and 200 ppb for H/HD/HT or may be returned to the Permittee and managed as F999 waste in accordance with 2.2.2.21.9 through 2.2.2.21.10.

2.2.2.21.9. DPE suits may be managed off site as an F999 listed hazardous waste if the requirements of paragraph 2.2.2.21.4. are met and an analysis of an extract prepared from a sample of the suits is below 20 ppb for GB and VX and 200 ppb for H/HD/HT.

2.2.2.21.10. DPE suits shipped off site as F999 hazardous waste shall be managed at a Subtitle C TSDF.

2.2.2.22. Spent Non-Agent Contaminated MDB Equipment Hydraulic Fluid and Lubricating Oil

2.2.2.22.1. Spent hydraulic fluid and lubricating oil generated in the MDB to be transported off site for treatment shall be analyzed for chemical agent concentration, HRA metals, and TCLP organics.

2.2.2.22.2. MDB-generated spent hydraulic fluid and lubricating oil having agent concentrations less than 20 ppb for GB and VX, and 200 ppb for H/HD/HT may be managed at an off-site Subtitle C TSDF or treated in the primary chamber of one of the LICs in accordance with Section 2.2.1.15.

2.2.2.22.3. MDB-generated spent hydraulic fluid and lubricating oil contaminated with chemical agent at or above 20 ppb for GB and VX, and 200 ppb for H/HD/HT, shall be managed in accordance with Section 2.2.1.15.

2.2.2.22.4. The failure of a mechanical system inside the MDB could result in the generation of fluids contaminated with chemical agent and be comingled with spent decontamination solution. These fluids shall be collected in sumps and transferred to SDS-TANK-101, SDS-TANK-102 or SDS-TANK-103 and managed as described in Section 2.2.1.4 or 2.2.2.28.

2.2.2.22.5. Rags and absorbent materials from cleanup of hydraulic fluid and lubricating oil spills shall be characterized and managed appropriately.

2.2.2.23. Reserved

2.2.2.24. CAL Aqueous Wastes

2.2.2.24.1. Operation of analytical equipment within the CAL results in the generation of an aqueous waste stream.

2.2.2.24.2. CAL aqueous waste shall be analyzed for agent concentration, corrosivity (pH), ignitability, TC metals, and TC organics.

2.2.2.24.3. CAL aqueous wastes may be transported off site for further treatment and ultimate disposal at a Subtitle C TSDF only if the agent concentration in the waste is below 20 ppb for agents GB and VX, and 200 ppb for agent H/HD/HT.

2.2.2.25. CAL Solid Wastes (debris)

2.2.2.25.1. CAL generated solid wastes consist of but are not limited to discarded glassware, wipe cloths, paper, PPE, plastic, wood, pipet tips, DAAMS tubes, transfer tubes, silver-fluoride pads, discarded analytical equipment components, and vermiculite.

2.2.2.25.2. Each individual item comprising this waste stream is decontaminated before it is placed into the accumulation container. Over time as the container is filled, decontamination solution residues (that once clung to the item) collect in the bottom of the container. A sample of this residual decontamination solution shall be taken from the bottom of each container of CAL solid debris generated and analyzed for chemical agent.

2.2.2.25.3. Containers having analytical results demonstrating the agent concentration in the decontamination solution is below 20 ppb for GB and VX, and 200 ppb for H/HD/HT, shall be classified as F999 listed hazardous wastes.

2.2.2.25.4. Containers having final analytical results demonstrating the agent concentration in the decontamination solution is at or above 20 ppb for GB and VX, and 200 ppb for H/HD/HT shall be placed into permitted storage until the Executive Secretary approves a treatment plan.

2.2.2.26. MSB Solid Waste (debris)

2.2.2.26.1. MSB generated solid wastes consist of but are not limited to wipe cloths, PPE, discarded monitoring system components, tygon tubing, silver-fluoride pads, DAAMS tubes, pre-concentrator tubes, and discarded analytical equipment.

2.2.2.26.2. This waste stream shall be sampled, analyzed, and managed as described in paragraphs 2.2.2.25.2 through 2.2.2.25.4

2.2.2.27. Sump 110

2.2.2.27.1. Sump 110 is a collection sump designed to receive precipitation run-off collected on the incinerator PAS concrete pads. In the event of a PAS process equipment leak, the potential exists for Sump 110 to also accumulate incinerator PAS liquids/solids (e.g., scrubber brines). These liquids/solids generated from the treatment of chemical agents and chemical agent munitions are a listed hazardous waste in Utah.

2.2.2.27.2. If the material (either liquid or solids) accumulated in Sump 110 is to be transferred off site for treatment and/or disposal, a sample of the material shall be analyzed for agent concentration, pH, TCLP metals, and TCLP organics. If the agent concentration is below 20 ppb for GB or VX, or below 200 ppb for H/HD/HT, then the material may be transferred off site for treatment and/or disposal.

2.2.2.27.3. Unless the Permittee can demonstrate in accordance with R315-2-3(d) that the material removed from the sump is not a hazardous waste, the material shall be managed as a hazardous waste.

2.2.2.27.4. To determine if liquid collected in Sump 110 shall be treated on site or transferred off site for further treatment and disposal, the liquids shall be visually inspected for the presence or absence of a surface oil sheen. Sump 110 liquids having a surface oil sheen, which is evidence that organics were mixed with the sump contents, shall not be transferred to the BRA for on-site treatment.

2.2.2.27.5. When material accumulated in Sump 110 is transferred off site in tankers, the material in each tanker shall be sampled and analyzed for pH, TCLP metals and TCLP organics. The material shall also be analyzed to confirm that agent concentrations are at or below either 20 ppb for GB and VX, or 200 ppb for H/HD/HT.

2.2.2.27.6. If no surface oil sheen is visually present on the liquid accumulated in Sump 110, the liquid may be transferred to one of the BRA-Tanks. Any solid material removed from the sump shall be managed as a hazardous waste.

2.2.2.27.7. Instead of off-site treatment/disposal, the liquid accumulated in Sump 110 may be transferred to one of the BRA-Tanks provided no surface oil sheen is visually present. Likewise, any solid material removed from the sump may be containerized and then stored and/or treated on site.

2.2.2.28. Spent Decontamination Solutions

2.2.2.28.1. Sodium hydroxide-based spent decontamination solutions generated during the GB campaign may be treated on site by incineration or shipped off site for disposal. The decontamination solutions used for VX and mustard agent campaigns shall be incinerated on site. Each tank of spent decontamination solution collected in SDS-TANK-101, SDS-TANK-102, and SDS-TANK-103 shall be analyzed for chemical agent concentration, corrosivity (pH), specific gravity, BTU (heat content), ignitability, total halogens, total organics, explosives and HRA metals. The purpose of the organic analysis is to confirm that the spent decontamination solution waste streams were properly segregated from other waste streams.

2.2.2.28.2. If chemical agent concentrations are below 20 parts per billion (ppb) for GB, then the GB spent decontamination solution may be shipped off site for disposal. If chemical agent is detected at or above 20 ppb, additional decontamination solution shall be added to the SDS tank, the contents of the tank shall be recirculated (i.e., mixed) and another sample analyzed.

2.2.2.28.3. Before transfer to tanker trucks, the 90-day tank shall be analyzed for chemical agent concentrations, pH, and specific gravity. Once the sample is taken, no additional spent decontamination solution may be added to the 90-day tank.

2.2.2.28.4. In addition to the above, the following restrictions shall apply to off-site shipments:

2.2.2.28.4.1. The TOCDF shall impose contractual restrictions on the transporters and off-site management facilities to ensure that the spent decontamination solutions are directly fed into an incinerator from either the tanker truck or tank(s) dedicated to storing only this waste stream; no commingling of waste streams.

2.2.2.28.4.2. The TOCDF shall impose contractual restrictions on the transporters and off-site management facilities to ensure the spent decontamination solution pH is not lowered in each tanker or in the off-site tank(s) dedicated to storing only this waste stream.

2.2.2.28.4.3. The off-site treatment facilities to which the TOCDF may ship are limited to hazardous waste incineration facilities.

2.2.2.28.4.4. The off-site transporters and management facilities shall be trained in chemical agent exposure and spill response before shipment.

2.2.2.29. Residues Resulting from the Special Handling of GB Agent Bulk Containers

2.2.2.29.1. Waste resulting from the treatment of bulk containers requiring special handling include the successfully rinsed out containers that have been processed through the MPF, liquid rinsate (i.e., spent decontamination solution), and rinsate solids. The MPF processed bulk containers will be managed as specified in Section 2.2.2 of this attachment.

2.2.2.29.2. Special handling rinse material will be accumulated and treated in accordance with R315-5-3.34. The solutions and suspended solids resulting from each bulk container rinse are collected and mixed in the Conditioning and Settling System (CSS). The pH of the rinsate will be adjusted above 9 using sodium hydroxide to ensure agent neutralization and then will be lowered as necessary for optimum metals precipitation.

2.2.2.29.3. The pH adjusted rinsate will be transferred to a settling device where the heavy metals fall out of solution, allowing the liquid and solid residues to be separated. After settling is complete, the separated liquids will be transferred to the SDS Tanks and managed as spent decontamination solution. Spent decontamination management requirements are specified in Sections 2.2.1.4 or 2.2.2.28 of this attachment.

2.2.2.29.4. Spent decontamination solutions from the CSS that are incinerated on site shall be fed to the Liquid Incinerator (LIC) Secondary Chambers in accordance with the metal feed rates specified for the LIC primary chambers. Spent decontamination solutions from the CSS and chemical agent shall not be fed at the same time.

2.2.2.29.5. Solids generated from the CSS will be analyzed for agent concentration, TCLP metals, and TCLP organics. Waste found to have an agent concentration greater than the WCL will be treated with additional decontamination solution until the agent is destroyed. These analyses will be performed once each time the conditioning device or settling device is cleaned out. These solids will be shipped off site to a Subtitle C TSDF.

2.2.2.30. GB Agent Bulk Containers Failing Special Handling

2.2.2.30.1. Bulk containers that are unable to be successfully rinsed out by the special handling process will be managed as F999 hazardous waste as a minimum (additional waste codes may apply) and be shipped to an off-site Subtitle C TSDF.

2.2.2.30.2. An analysis will be performed on failed bulk containers to ensure there will be no environmental or health impacts resulting from their off-site management. Samples of the final rinse volume and any solids remaining in the bulk container will be taken. The final rinse volume will be analyzed for pH and agent. The solids will be analyzed for TCLP metals, TCLP organics, and agent.

2.2.2.30.3. Bulk containers failing the special handling process will be shipped to an off-site Subtitle C TSDF provided the agent analytical results for the final rinse and solids sampling show the agent concentrations to be less than 20 ppb.

2.2.2.31. Non Agent Contaminated Mine Drums

2.2.2.31.1. Each individual mine drum will be assigned a unique identifying number for tracking purposes. The status of each mine drum, including the criteria listed below, will be tracked on appropriate forms and documented in the Operating Record.

2.2.2.31.2. Mine drums, lids, rings, and packing material that have not been contaminated by agent will be transported off-site and managed as a non-RCRA waste. The mine drums may be crushed in the UPA to facilitate loading and transport. To be considered uncontaminated, all of the following conditions shall be satisfied:

2.2.2.31.2.1. The waste material was not associated with leakers;
2.2.2.31.2.2. The operators inspect the interior of each mine drum when unpacking and no liquid is detected when removing the mines from the associated mine drums;
2.2.2.31.2.3. The ACAMS readings for the ECV were less than 0.5 TWA for VX during the time the mine drums were unpacked in the ECV; and
2.2.2.31.2.4. The waste material was monitored in the airlock between the ECV and the UPA and was shown to be less than 0.5 TWA for VX.

2.3. PARAMETER TEST METHODS R315-8-2.4 [40 CFR 264.13(b)(2)];

2.3.1. Table 2-3 provides a listing of the analytical methods that shall be used to detect and quantify the selected parameters. This information is presented in a relational format in Tables 2-0 and 2-1 (the WAP Summary Tables).

2.3.2. The on-site Chemical Assessment Laboratory (CAL) shall perform the analyses related to chemical agent and other CAL-assigned analyses listed in Tables 2-0 and 2-1.

2.3.3. The CAL shall be Utah-certified to perform analyses for the parameters that require Utah certification.

2.3.4. Off-site analyses shall be performed by a Utah-certified laboratory for the parameters listed in Table 2-3.

2.3.5. The off-site laboratories selected shall be certified by the State of Utah for the methods referenced in this waste analysis plan. When new promulgated methods are approved by EPA, the Permittee shall notify the off-site laboratories of the required change and request a time frame of when the change will occur. A laboratory will have six months to submit documentation to the Permittee of the change or a time frame when the change will be completed. The laboratory must use the most recently approved method within one year of promulgation. If that is not possible, a written request for extension must be provided to the Executive Secretary for approval. Only SW-846 promulgated methods shall be used unless an alternate method is approved by the Executive Secretary.

2.4. **SAMPLING METHODS R315-50-6 [40 CFR 264.13(b)(3)];**

2.4.1. The sampling methods to be used for each waste stream are found in Tables 2-0 and 2-1 (the WAP Summary Tables).

2.5. **FREQUENCY OF ANALYSES R315-8-2.4 [40 CFR 264.13(b)(4)];**

2.5.1. The frequencies at which each waste stream shall be sampled and analyzed are found in Tables 2-0 and 2-1 (The WAP Summary Tables).

2.6. **ADDITIONAL REQUIREMENTS FOR WASTES GENERATED OFF SITE R315-8-2.4 [40 CFR 264.13(b)(5)];**

2.6.1. The Permittee is not permitted to store or treat waste generated off site. The Permittee is only permitted to store and treat wastes generated by the facility having EPA ID Number UT5210090002.

2.7. **ADDITIONAL REQUIREMENTS FOR IGNITABLE, REACTIVE, OR INCOMPATIBLE WASTES R315-8-2.8 [40 CFR 264.13(b)(6)];**

2.7.1. The Permittee shall comply with R315-8-2.8 for management of ignitable, reactive, or incompatible wastes. The facility area map found in Attachment 1 (Facility Description) of this Permit shows the locations of the permitted container storage HWMUs associated with the TOCDF.

2.8. **RECORDKEEPING REQUIREMENTS R315-8-5.3 [40 CFR 264.73(b)(3)];**

2.8.1. In accordance with Module II.I, analytical results generated in compliance with Attachment 2 (Waste Analysis Plan) shall be maintained on file at the TOCDF as part of the Operating Record.

2.9. **SAMPLING AND ANALYSIS QA/QC PROCEDURES**

2.9.1. The Laboratory Quality Control Plan in Attachment 3 describes the Quality Assurance/Quality Control procedures established at the TOCDF to ensure integrity and accuracy of the waste sampling and analysis effort.

2.10. **SUBPART CC AND BB SAMPLING AND ANALYTICAL PROCEDURES**

2.10.1. The Permittee shall perform initial or change-of-process waste determinations for hazardous waste listed in Tables 2-0 and 2-1 for wastes managed in containers, primary containment sumps, and tanks identified in Table 2 entitled “Hazardous Waste/Permitted Hazardous Waste Management Units” and Table 4 entitled “Hazardous Waste Sump Systems”. These determinations shall be made at the points of waste origination for average VOCs before the first time any portion of the waste stream is placed in an applicable container, primary containment sump, and tank system.

2.10.2. The average VOC is the mass-weighted average of a hazardous waste as made in accordance with Section 2.10.1. The Permittee may choose from the two following sets of requirements for waste determinations:

2.10.2.1. Direct measurements or methods specified in Table 2-3 or

2.10.2.2. Knowledge-based determinations.

2.10.3. Waste determinations for VOC through direct measurements shall document the point of waste origination and the average VOC for an averaging period. The averaging period for all waste streams shall be designated and documented in the Operating Record. The averaging period can represent any time interval that the Permittee determined is appropriate for each hazardous waste stream of this section, but shall not exceed one year.

2.10.4. Direct sample measurements shall be taken at the points of waste generation in manner to eliminate volatilization, biodegradation, reaction, or sorption during the sample collection storage and preparation steps. For ACS and SDS tank systems, the point of origination shall be considered the tank. A minimum of four samples shall be collected at the points of origination for applicable waste streams identified in this attachment. All samples for a given waste determination shall be collected within a one-hour period. The average of the four sample results constitutes a waste determination for the waste stream. All samples used for waste analysis shall be representative of the highest VOC.

2.10.5. All samples shall be collected and analyzed in accordance R315-7-30 [40 CFR 265.1084], Attachment 3 (Sampling, Analytical, and QA/QC Procedures), and this Attachment.

2.10.6. The Permittee may also apply other methods and requirements of R315-7-30 [40 CFR 265.1084(a)(3)] for samples collected and analyses to determine VOC, provided the methods are approved by the Executive Secretary as required by R315-3-4.

2.10.7. All direct measurements used for sampling and analytical results which require implementation of Module X and Section 2.10, Subpart CC waste analysis requirements shall be documented in the Operating Record and shall include the following:

2.10.7.1. Point of waste generation
2.10.7.2. Averaging period
2.10.7.3. Sampling plan used (See 40 CFR 265.1084(b)(3)(ii)(C))
2.10.7.4. Date, time, and location where the samples were collected (40 CFR 264.1089(f))
2.10.7.5. Quality assurance program including procedures to minimize loss of organics during sampling and measurement of accuracy of procedures (40 CFR 265.1084(a)(3)(iii)(F))

2.10.7.6. Analytical method used (40 CFR 264.13(b))
2.10.7.7. Identification of the analyst who performed the analytical tests, and
2.10.7.8. Analytical operating conditions.

2.10.8. Knowledge-based determinations may be used for making waste determinations provided that there is sufficient information to meet the requirements found in R315-8-22 [40 CFR 265.1084(a)(4)].

2.10.9. The Permittee shall make and update all analytical determinations required by Section 2.10 annually or prior to an agent campaign change for waste streams identified in this Attachment.

2.10.10. For waste streams identified in Tables 2-0 and 2-1 that are determined during sampling to have VOC above 500 ppm and are not managed with air emission controls as required by R315-8-22 [40 CFR 264.1084 through 264.1087], the Permittee shall notify the Executive Secretary of each occurrence of non-compliance and prepare plans for the adoption of air emission control requirements or waste determinations as required by this section.

2.10.11. The maximum organic vapor pressure waste determinations shall be performed by either direct measurement or knowledge of the waste prior to the first time hazardous waste is placed in the tank unit. Waste determinations for tank systems listed on Table 2 entitled "Hazardous Waste/Permitted Hazardous Waste Management Units" shall be performed as specified by R315-8-22 [40 CFR 265.1084(c)] for tank systems using Level One control.

2.10.12. Direct measurements for maximum organic vapor pressure shall be one of the following:

2.10.12.1. Method 25E in 40 CFR 60, Appendix A;

2.10.12.2. ASTM Standard Test Method for Vapor Pressure, ASTM 2879-92 (40 CFR 260.11).

2.10.13. Knowledge of the waste for maximum organic vapor pressure shall be determined in accordance with Paragraph 2.10.11.

2.10.14. As indicated below, the following wastes and waste management units are exempt from certain Subpart CC and sampling and analytical requirements of this Section:

2.10.14.1. Hazardous waste that has been treated or reduced by an organic destruction or removal process that satisfies any one of the requirements and conditions of R315-8-22 [40 CFR 264.1082(c)] is not subject to waste analysis requirements of Section 2.10.

2.10.14.2. Hazardous waste and residues, which are to be managed in containers, sumps, and tanks, which are complying with the air emission control standards of R315-8-22 [40 CFR 264.1084 through 1087] are not subject to waste analysis requirements of Section 2.10.

2.10.14.3. Wastes which are collected subject to chemical events, and discharges of wastes subject to spill clean-up requirements are not subject to the waste analysis requirements of Section 2.10.

2.10.14.4. The sumps and tank systems that must meet Level Two air emission control standards specified by R315-8-22 [40 CFR 264.1084(b)(2)] are not subject to maximum organic vapor pressure determinations of Section 2.10.

2.10.14.5. Wastes that satisfy the requirements specified in R315-8-22 [40 CFR 264.1082(c)(4)] are not subject to waste analysis requirements of Section 2.10.

2.10.15. The Permittee shall perform required waste analysis determinations for Subpart BB equipment identified in 40 CFR 264.1052 through 264.1062, that contains or contacts hazardous waste with organic concentrations that equal or exceed 10 percent by weight using the analytical methods listed in Table 2-0 and Table 2-1 by either direct measurement or by using knowledge-based determinations in Section 2.10.19.

2.10.16. Direct measurements shall be obtained by collecting Subpart BB samples and performing an analysis as specified by Section 2.10.5 to determine organic concentration levels for equipment.

2.10.17. All samples and analysis results required by Section 2.10.19.2 shall be documented in the Operating Record.

2.10.18. All analytical samples collected shall be representative of the highest total organic content of hazardous waste that contacts equipment.

2.10.19. Application of knowledge of the nature of the waste or the process may be used for waste determination for Subpart BB equipment, provided that the Permittee documents the waste determination by one of the following procedures:

2.10.19.1. A demonstration that shows that no organics are used or are in contact with the equipment at a particular point in the process.

2.10.19.2. Direct measurement data for waste streams listed in Table 2-0 and 2-1 may be used for equipment in contact with an identical hazardous waste stream that contains a total organic concentration of less than 10 percent by weight. If direct measurement methods are used to supplement knowledge-based determination, the following shall be maintained:

2.10.19.2.1. The analytical method

2.10.19.2.2. Sampling procedures

2.10.19.2.3. Sample variability

2.10.19.2.4. Analytical variability associated with the test method that was used [40 CFR 265.1084(a)(4)]

2.10.19.2.5. Location of sample collection

2.10.19.2.6. Date and times samples were taken

2.10.19.3. If knowledge is to be used instead of the specified test method for a specific waste, then the following shall be documented in the Operating Record to support the knowledge-based determination:

2.10.19.3.1. Organic material balances of the source generating the waste or

2.10.19.3.2. Previous organic constituent test data or

2.10.19.3.3. Any other information, including but not limited to manifests, shipping papers, and waste certification notices.

2.10.20. Samples collected for leak detection monitoring requirements specified by Module X.C and X.D, shall be obtained to meet the performance standards of 40 CFR 60, Method 21. Monitoring requires that samples be taken in close proximity to the Subpart BB Equipment, and documented exceedances of Method 21. Sampling shall be performed in accordance with the frequencies established by Module X.C.

Table 2-0
TOCDF WASTE ANALYSIS PLAN SUMMARY

2.2.1 WASTES REQUIRING ON-SITE TREATMENT

	WASTE STREAM	TREATMENT UNIT(S)	ANALYTICAL PARAMETERS[5,7]	ANALYTICAL METHODS[1,5]	FREQUENCY OF ANALYSIS[5] (establish profile)	SAMPLING METHOD[5]
2.2.1.3.	Chemical Agent (Initial Waste Profile)	LIC 1 LIC 2 MPF DFS	Based on an Approved Agent Sampling and Analysis Plan	Based on an Approved Agent Sampling and Analysis Plan	Prior to agent campaign, sampling/analysis requirements based on agent specific sampling plan.	Based on an Approved Sampling and Analysis Plan
2.2.1.3	Chemical Agent (Process Analysis)	LIC 1 LIC 2 MPF DFS	Agent % Purity HRA Metals % Organics Agent Organic Content Specific gravity pH	TE-LOP-584 TE-LOP-584, 3050B, 6010B/6020/7470A and TE-LOP-557 TE-LOP-572 TE-LOP-584 TE-LOP-584 TE-LOP-574 (9040B)	During each agent campaign, one sample analyzed for each munitions/bulk item campaign or every three months, which ever is shorter	Tap or Remote Agent Sampling System if sample is collected from ACS-Tank-101 or 102 or Tap if collected from the Agent Quantification System or Pipette if agent sample is taken directly from munitions or bulk container
		ACS-TANK-101, 102	HRA Metals	TE-LOP-584, 3050B, 6010B/6020/7470A and TE-LOP-557	One sample from every full tank of agent collected in the ACS tank.	Tap or Remote Agent Sampling System if sample is collected from ACS-Tank-101 or 102 or Tap if collected from the Agent Quantification System
			Agent Organic Content Density	TE-LOP-584 TE-LOP-584	One sample from every fifth full tank of agent collected in the ACS tank	Tap or Remote Agent Sampling System if sample is collected from ACS-Tank-101 or 102 or Tap if collected from the Agent Quantification System

Table 2-0
TOCDF WASTE ANALYSIS PLAN SUMMARY

2.2.1 WASTES REQUIRING ON-SITE TREATMENT

WASTE STREAM	TREATMENT UNIT(S)	ANALYTICAL PARAMETERS[5,7]	ANALYTICAL METHODS[1,5]	FREQUENCY OF ANALYSIS[5] (establish profile)	SAMPLING METHOD[5]
2.2.1.4 Spent Decontamination Solution[5]	LIC 1 and LIC 2 Secondary Chamber	Agent Concentration % Organics Corrosivity (pH) Specific Gravity	TE-LOP-572 TE-LOP-572 TE-LOP-574 (9040B) TE-LOP-574	Each SDS-TANK prior to treatment	Tap
		Explosives HRA Metals	8330/8332 3050B, 6010B/7470A	Samples collected from the SDS tanks every three months as a confirmatory analysis	
Spent Decontamination Solution Additional Analysis (Organic Content[5] > 5%)		Ignitability HRA Metals TC Organics	1020A, 1010 3050B, 6010B/7470A 5030B, 8260B 3510C/3520C, 8270C	Each SDS-TANK having an organic content greater than 5% by weight	
2.2.1.5 Agent Collection System & Agent Quantification System Maintenance Residues[5]	MPF	Agent Organic Content HRA metals The feed charge and characterization based on description allowed by Table 2-4	TE-LOP-584 3050B, 6010B/7470A/6020	Prior to treatment in the MPF, ACS tank bottoms will be analyzed Feed charge and characterization based on description allowed by Table 2-4	Scoop
2.2.1.6. Metallic Agent Contaminated Debris: See Table 2-4 for the list of wastes	MPF	Generator knowledge, composition of waste prevents a representative sample from being taken	Wastes shall be weighed and thoroughly characterized prior to treatment in the MPF		
2.2.1.7 Drained Bulk Containers/Projectiles with Agent Residue	MPF	Non-embedded metals (Appendix B) and generator knowledge based on analytical results obtained from line item 2.2.1.3			
2.2.1.8 Energetic Munitions Components	DFS	Manufacturer Specifications (Appendix C)			
2.2.1.9 ECR Maintenance Residues (M55 Rocket Processing) See Table 2-2a for list of wastes ECR Maintenance Residues (Projectile Processing) See Table 2-2a for list of wastes	DFS	Generator knowledge based on analytical results obtained from line items 2.2.1.3 and 2.2.1.8.			

Table 2-0
TOCDF WASTE ANALYSIS PLAN SUMMARY

2.2.1 WASTES REQUIRING ON-SITE TREATMENT

	WASTE STREAM	TREATMENT UNIT(S)	ANALYTICAL PARAMETERS[5,7]	ANALYTICAL METHODS[1,5]	FREQUENCY OF ANALYSIS[5] (establish profile)	SAMPLING METHOD[5]
2.2.1.10	Spent Activated Carbon from MDB HVAC & ACS-TANK Filter Systems	Permitted storage until on-site treatment method is approved by the Executive Secretary				
2.2.1.11	Agent Contaminated Dunnage (TMA and UPA Generated)	Permitted storage until on-site treatment method is approved by the Executive Secretary			See Section 2.2.1.11	
2.2.1.12	Non-metallic Agent Contaminated Debris: PPE (Butyl Rubber) CAL Solid Waste (debris) MSB Solid Waste (debris) DAAMS Absorbent Tubes MDB Maintenance Equipment	Permitted storage until on-site treatment method is approved by the Executive Secretary	.		See Section 2.2.1.12	
2.2.1.13	PPE Respirator Canisters	Permitted storage until on-site treatment method is approved by the Executive Secretary			See Section 2.2.1.13	
2.2.1.14	Spent Scrubber Brines	BRA	Agent Concentration Corrosivity (pH) Specific Gravity	TE-LOP-572 TE-LOP-574 (9040B) TE-LOP-574	Each BRA-TANK prior to treatment in the BRA	Tap
			HRA Metals Total Organics[5]	3050B, 6010B/7470A 5030B, 8260B 3510C/3520C, 8270C	A sample collected and analyzed from each BRA Tank containing brine every month or each munition campaign change, whichever is sooner.	

Table 2-0
TOCDF WASTE ANALYSIS PLAN SUMMARY

2.2.1 WASTES REQUIRING ON-SITE TREATMENT

WASTE STREAM	TREATMENT UNIT(S)	ANALYTICAL PARAMETERS[5,7]	ANALYTICAL METHODS[1,5]	FREQUENCY OF ANALYSIS[5] (establish profile)	SAMPLING METHOD[5]
2.2.1.15 Miscellaneous Agent Contaminated and Non-Agent Contaminated Liquid Wastes	LIC 1 and LIC 2 Primary Chamber	HRA Metals Review of manufacturer's information for all Properties) for organic constituents identified in Permit.	3050B, 6010B/7470A	Once for every batch[2]. Analysis to be completed prior to treatment.	Tap
2.2.1.16 Bulk Containers Processed via Special Handling	MPF	HRA Metals (excluding Aluminum, Beryllium, Boron)	TE-LOP-3010A, or 6010B/7470A, or 6020	One sample for analysis of final rinse water from each bulk container processed by Special Handling System	Remote Sampling System or Coliwasa

Footnotes:

1. Analytical methods included those unique to TOCDF (designated as TE-LOP-XXX) and EPA SW-846 methods.
2. A batch is defined as all the drums (or containers) of waste generated from the same event, at the same location.
3. TCLP organics are defined as those compounds described by 40 CFR 261.24 by the waste codes D018, D019, D021, D022, D023, D024, D025, D026, D027, D028, D029, D030, D032, D033, D034, D035, D036, D037, D038, D039, D040, D041, and D042.
4. Dioxins (PCDDs) and Furans (PCDFs) are additionally analyzed for only if waste is Toxicity Characteristic for organics.
5. In addition, the Permittee shall sample the organic analytical parameters using the sampling and analytical methods in accordance with Section 2.10.
6. TCLP metals are defined as those described in 40 CFR 261.24 as waste codes D004, D005, D006, D007, D008, D009, D010 and D011.
7. HRA metals are defined as the following Arsenic, Barium, Chromium, Cadmium, Lead, Mercury, Silver, Selenium, Aluminum, Antimony, Beryllium, Boron, Cobalt, Copper, Manganese, Nickel, Thallium, Tin, Vanadium and Zinc.

Table 2-1
TOCDF WASTE ANALYSIS PLAN SUMMARY

2.2.2 WASTES REQUIRING OFF-SITE TREATMENT/DISPOSAL

WASTE STREAM	GENERATION SOURCE	ANALYTICAL PARAMETERS[5]	ANALYTICAL METHODS[5]	FREQUENCY OF ANALYSIS[5] (establish profile)	SAMPLING METHOD
2.2.2.2. LIC Slag	LIC 1 LIC 2	TCLP Metals	1311, 6010B/7470A	After each rebricking, one sample composited from each container comprising a batch will be analyzed. If the metals concentration exceeds the metals regulatory limits each subsequent batch shall be analyzed for metals until the applicable waste codes no longer apply.	Hammer and Chisel or Coring Device
2.2.2.3 Treated M55 Rocket Parts/Ash or the Treated Residue Stream from the Simultaneous Processing of M55 Rocket Parts/Ash and GB Projectiles in the DFS	DFS HDC	Agent Concentration TCLP Metals TCLP Organics[3] PCB	TE-LOP-572 1311, 6010B/7470A 1311, 8260B/8270C5030B, 3510C/3520C 8082	Each month throughout M55 rocket campaign: One grab sample from each HDC waste bin generated in an operational 12 hr shift, composited into one sample for analysis	Thief, Scoop or Coring Device
		PCDD/PCDF[4] Explosive	8290 8330/8332	If the results indicate the waste is TC for organics, this waste stream shall be additionally analyzed for dioxins/ furans and explosives each month	
		Agent Concentration PCB	TE-LOP-572 8082	In the event waste is discharged from the HDC during upset, analyze one sample taken from each HDC waste bin generated during the upset	
2.2.2.4 Treated Burster & Fuse Bodies/Ash	DFS HDC	Agent Concentration TCLP Metals TCLP Organics[3]	TE-LOP-572 1311, 6010B/7470A 1311, 8260B/8270C5030B, 3510C/3520C	Each agent/munitions campaign or annually, whichever is shorter: One grab sample from each HDC waste bin generated in an operational 12 hr shift, composited into one sample for analysis	Thief, Scoop or Coring Device
2.2.2.5 Treated VX Mine/Fuse Bodies/Ash	DFS HDC	Agent Concentration TCLP Metals TCLP Organics[3]	TE-LOP-572 1311, 6010B/7470A 1311, 8260B/8270C,5030B, 3510C/3520C	Each month throughout each munitions campaign: One grab sample from each HDC waste bin generated in an operational 12 hr shift, composited into one sample for analysis	Thief, Scoop or Coring Device

Table 2-1
TOCDF WASTE ANALYSIS PLAN SUMMARY

2.2.2 WASTES REQUIRING OFF-SITE TREATMENT/DISPOSAL

WASTE STREAM	GENERATION SOURCE	ANALYTICAL PARAMETERS[5]	ANALYTICAL METHODS[5]	FREQUENCY OF ANALYSIS[5] (establish profile)	SAMPLING METHOD
2.2.2.5 Treated VX Mine/Fuse Bodies/Ash (continued)	DFS HDC	Agent Concentration	TE-LOP-572	In the event waste is discharged from the HDC during upset, analyze one sample taken from each HDC waste bin generated during the upset.	Thief, Scoop or Coring Device
2.2.2.6 DFS Cyclone Residues	DFS	Agent Concentration	TE-LOP-572	One core sample from each container generated	Scoop or Coring Device
		Agent Concentration TCLP Metals TCLP Organics[3]	TE-LOP-572 1311, 6010B/7470A 1311, 8260B/8270C	Every three months or each agent/munitions campaign whichever is shorter: One core sample from each container comprising a batch, composited into one sample for analysis.	
		PCDD/PCDF Explosives	8290 8330/8332	If analytical results demonstrate the waste to be TC for organics, waste stream shall be analyzed for dioxins/furans and explosives	
		PCB	8082	Additionally, during M55 rocket processing, samples shall be analyzed for PCBs, initially then every three months.	
2.2.2.7 Treated Bulk Containers/Projectiles/Mortar Rounds (Scrap Metal)	MPF	Chemical Agent Concentration	See Section 2.2.2.7	Each Burn Tray: Monitor a minimum of one cycle	ACAMS
2.2.2.8 MPF Treated Debris: Table 2-4 waste residues	MPF	Chemical Agent Concentration	See Section 2.2.2.8	Each Burn Tray: Monitor a minimum of one cycle	ACAMS
2.2.2.9 MPF Burn Tray and Cutaway Ton Container Residues	MPF	Agent Concentration TCLP Metals TCLP Organics[3]	TE-LOP-572 1311, 6010B/7470A 1311, 8260B/8270C	Every three months or each agent/munitions campaign whichever is shorter. Collect one representative sample.	Scoop or Coring Device
2.2.2.10 Spray Tank Nose Cones	MPF	Generator knowledge based on manufacture specifications or TCLP metals	 1311, 6010B/7470A	 Once per campaign	 Suitable Sampling Device

Table 2-1
TOCDF WASTE ANALYSIS PLAN SUMMARY

2.2.2 WASTES REQUIRING OFF-SITE TREATMENT/DISPOSAL

WASTE STREAM	GENERATION SOURCE	ANALYTICAL PARAMETERS[5]	ANALYTICAL METHODS[5]	FREQUENCY OF ANALYSIS[5] (establish profile)	SAMPLING METHOD
2.2.2.11 Incinerator Refractory	LIC 1 LIC 2 MPF DFS DUN	TCLP Metals	1311, 6010B/7470A	Each chamber change out: One grab sample from 10% of the containers comprising a batch, composited into one sample for analysis	Hammer and Chisel or Coring Device
2.2.2.12 PAS Residues	DFS PAS LIC 1 PAS LIC 2 PAS MPF PAS	Agent Concentration Corrosivity (pH)	TE-LOP-572 TE-LOP-574 (9040B)	Each container: One core sample for analysis	Trier or Coring Device
		Free Liquids TCLP Metals TCLP Organics[3] PCBs	TE-LOP-574 (9095) 1311, 6010B/7470A 1311, 8260B/8270C 8082	Initially for a new agent or munition campaign then every three months thereafter. During M55 Rockets agent/munitions campaign initially, then annually collected from first container generated	Trier or Coring Device
2.2.2.13 Scrubber Brines	DFS PAS LIC 1 PAS LIC 2 PAS MPF PAS BRA TANKS	Agent Concentration Corrosivity (pH) Specific Gravity	TE-LOP-572 TE-LOP-574 (9040B) TE-LOP-574	Each BRA-TANK one sample for analysis prior to shipment, or each tanker if transferred directly from the PAS.	Tap, Coliwasa, or Bailer depending on sample location
		TC Metals TC Organics[3] PCB	1311, 6010B/7470A 1311, 8260B/8270C 8082	Each month or munition campaign change, whichever is sooner, one composite sample comprised of a sample from each BRA Tank. PCB analysis is required only if M55 rockets are processed.	Tap, Coliwasa, or Bailer, depending on sample location, while tank is being filled.

Table 2-1
TOCDF WASTE ANALYSIS PLAN SUMMARY

2.2.2 WASTES REQUIRING OFF-SITE TREATMENT/DISPOSAL

WASTE STREAM	GENERATION SOURCE	ANALYTICAL PARAMETERS[5]	ANALYTICAL METHODS[5]	FREQUENCY OF ANALYSIS[5] (establish profile)	SAMPLING METHOD
2.2.2.14. SDS-TANK Sludge	SDS-TANK	Agent Concentration Corrosivity (pH) Free Liquids Explosives TCLP Metals TCLP Organics[3]	TE-LOP-572 TE-LOP-574 (9040B) TE-LOP-574 (9095) 8330/8332 1311, 6010B/7470A 1311, 8260B/8270C	Each batch of sludge.	Tap, Coliwasa, or Bailer depending on sample location
		Agent Concentration Corrosivity (pH) Free Liquids	TE-LOP-572 TE-LOP-574 (9040B) TE-LOP-574 (9095)	If the agent concentration is found to be greater than the WCL, decontamination solution will be added and another sample analyzed for agent, pH and free liquids..	
2.2.2.15. BRA-TANK Sludges	BRA-TANK	Agent Concentration Corrosivity (pH) Free Liquids TCLP Metals TCLP Organics[3] PCBs	TE-LOP-572 TE-LOP-574 (9040B) TE-LOP-574 (9095) 1311, 6010B/7470A 1311, 8260B/8270C 8082	Each batch of sludge. During M55 Rocket agent /munitions campaign, annually collect a sample from the first container generated.	Trier or Coring Device
2.2.2.16. PAS Demister Candle Sleeves	DFS PAS LIC 1 PAS LIC 2 PAS MPF PAS	Agent Concentration TCLP Metals TCLP Organics[3]	TE-LOP-572 1311, 6010B/7470A 1311, 8260B/8270C	Each change out: Grab samples representative of the waste stream will be analyzed prior to shipment	Determined worse case section cut sleeve
		PCB	8082	During M55 Rocket agent /munitions campaign, annually collect a grab sample from 10% of the drums comprising each batch.	Determined worse case section cut sleeve
2.2.2.17. Scrubber Brine Salts	BRA-DDYR	Agent Concentration Corrosivity (pH) Free Liquids TCLP Metals TCLP Organics[3]	TE-LOP-572 TE-LOP-574 (9040B) TE-LOP-574 (9095) 1311, 6010B/7470A 1311, 8260B/8270C	Initially then every three months during processing One core sample from each BRA-DDYR salt bin generated in an 12 hr operational shift, composited into one sample for analysis	Trier or Coring Device
		PCB	8082	During M55 Rocket processing, scrubber brine salts shall be analyzed for PCBs.	

Table 2-1
TOCDF WASTE ANALYSIS PLAN SUMMARY

2.2.2 WASTES REQUIRING OFF-SITE TREATMENT/DISPOSAL

WASTE STREAM	GENERATION SOURCE	ANALYTICAL PARAMETERS[5]	ANALYTICAL METHODS[5]	FREQUENCY OF ANALYSIS[5] (establish profile)	SAMPLING METHOD
2.2.2.18. BRA PAS Knockout Box Residues	BRA-PAS	Agent Concentration Corrosivity (pH) Free Liquids TCLP Metals TCLP Organics[3]	TE-LOP-572 TE-LOP-574 (9040B) TE-LOP-574 (9095) 1311, 6010B/7470A 1311, 8260B/8270C	Initially, then every three months during processing. One core sample from theBRA-PAS Knockout Box salt bin for analysis	Trier or Coring Device
		PCB	8082	During M55 Rocket processing, residues shall also be analyzed for PCBs.	
2.2.2.19. BRA PAS Baghouse Residues	BRA-PAS	Agent Concentration Corrosivity (pH) Free Liquids TCLP Metals TCLP Organics[3] PCB	TE-LOP-572 TE-LOP-574 (9040B) TE-LOP-574 (9095) 1311, 6010B/7470A 1311, 8260B/8270C 8082	Initially, then every three months during processing. One core sample from first four consecutively generated BRA-PAS Baghouse salt bins, composited into one sample for analysis. During M55 Rocket processing, residues shall be analyzed for PCBs.	Trier or Coring Device
2.2.2.20. Dunnage Generated in the Unpack Area	UPA	Chemical Agent TCLP Metals TCLP Organics	TE-LOP-572 1311, 6010B/7470A 3050A, 6010B/7471A 1311, 8260B/8270C,5030B, 3510C/3520C	One composite sample for analysis collected from a container on a quarterly basis (Every three months)	Wood plane to collect shavings from dunnage surface/ discolored or stained areas selected for sampling
2.2.2.21. DPE Suits	MDB	Agent Concentration (air)	ACAMS	Each bag of DPE suits, monitored for chemical agent. Suits with results below 0.2 TWA/CCL are sampled and analyzed for agent.	Piece cut from DPE suit front mid-section

Table 2-1
TOCDF WASTE ANALYSIS PLAN SUMMARY

2.2.2 WASTES REQUIRING OFF-SITE TREATMENT/DISPOSAL

WASTE STREAM	GENERATION SOURCE	ANALYTICAL PARAMETERS[5]	ANALYTICAL METHODS[5]	FREQUENCY OF ANALYSIS[5] (establish profile)	SAMPLING METHOD
		Agent Concentration (extraction)	TE-LOP-572	Samples of DPE suits passing the air monitoring shall be sampled and extracted/analyzed at a frequency of twenty percent of DPE suits or one sample per container, whichever is greater.	
2.2.2.22. Spent Non-Agent Contaminated Hydraulic Fluid and Lubricating Oil	MDB	Agent Concentration TCLP Organics[3] HRA metals	TE-LOP-572 1311, 8260B, 3580B, 8270C 6010B/7470A	Each batch: One sample each from 10% of the drums comprising a batch, composited into one sample for analysis	Coliwasa
2.2.2.23. Reserved					
2.2.2.24. CAL Aqueous Waste	CAL	Agent Concentration Corrosivity (pH) Ignitability TC Metals TC Organics[3]	TE-LOP-572 TE-LOP-574 (9040B) 1020 6010B/7470A 8260B, 8270C, 5030B, 3510C/3520C	Each container: One sample for analysis	Coliwasa
2.2.2.25. CAL Solid Wastes (debris)	CAL	Chemical Agent Concentration	TE-LOP-572	Each container: One sample of the decontamination solution collected at the bottom of the accumulation container taken for analysis	Coliwasa
2.2.2.26. MSB Solid Waste (debris)	MSB	Chemical Agent Concentration See section 2.2.2.25	TE-LOP-572	Each container: One sample of the decontamination solution collected at the bottom of the accumulation container taken for analysis	Coliwasa
2.2.2.27 Sump 110	Sump 110	Agent Concentration TCLP Metals TCLP Organics[3] pH	TE-LOP-572 1311, 6010B/7470A 1311, 8260B/8270C, 5030B, 3510C/3520C TE-LOP-574 (9040B)	Each tanker: One sample for analysis	Coliwasa

Table 2-1
TOCDF WASTE ANALYSIS PLAN SUMMARY

2.2.2 WASTES REQUIRING OFF-SITE TREATMENT/DISPOSAL

WASTE STREAM	GENERATION SOURCE	ANALYTICAL PARAMETERS[5]	ANALYTICAL METHODS[5]	FREQUENCY OF ANALYSIS[5] (establish profile)	SAMPLING METHOD
2.2.2.28. Spent Decontamination Solution	SDS	Agent Concentration HRA Metals Total Organics[3] pH Specific Gravity Total Halogens BTU Explosives Ignitability	TE-LOP-572 6010B//3010A7470A 8260B, 3510C, 8270C TE-LOP-574 (9040B) LOP 574 9056 ASTM D240-87 8330/8332 1010, 1020A	Each SDS Tank-101, 102 and 103	Tap
2.2.2.28.3. Spent Decontamination Solution	SDS	Agent Concentration pH Specific Gravity	TE-LOP-572 TE-LOP-574 (9040B) TE-LOP 574	Each 90-day SDS Tank	Tap

Footnotes:
1. The annotated methods identified are to be used. When new promulgated methods are approved by EPA, the Permittee shall notify the laboratory of the required change and request a time frame of when the change will occur. The laboratory will have six months to submit documentation to the Permittee of the change or a time frame when the change will be completed. The laboratory must use the most promulgated method within one year of promulgation. If that is not possible, a written request for extension must be provided to the Executive Secretary for approval.
2. A batch is defined as all the drums (or containers) of waste generated from the same event, at the same location.
3. TCLP organics are defined as those compounds described by 40 CFR 261.24 by the waste codes D018, D019, D021, D022, D023, D024, D025, D026, D027, D028, D029, D030, D032, D033, D034, D035, D036, D037, D038, D039, D040, D041, and D042.
4. Dioxins (PCDDs) and Furans (PCDFs) are additionally analyzed for only if waste isToxicity Characteristic for organics.
5. The Permittee shall sample the organic analytical parameters using the sampling and analytical methods and frequency of analysis in accordance with section 2.10.
6. TCLP metals are defined as those described in 40 CFR 261.24 as waste codes D004, D005, D006, D007, D008, D009, D010 and D011.
7. HRA metals are defined as the following Arsenic, Barium, Chromium, Cadmium, Lead, Mercury, Silver, Selenium, Aluminum, Antimony, Beryllium, Boron, Cobalt, Copper, Manganese, Nickel, Thallium, Tin, Vanadium and Zinc.

Table 2-2: Site-Generated Waste Streams			
Waste Stream	**Description**	**EPA Waste Codes[1]**	**Utah Waste Code**
MPF Metal	Metal parts after incineration.	N/A	F999
MPF Residue	MPF maintenance residue.	D006, D008	F999
LIC Slag (hazardous)	Slag generated in LIC secondary chamber.	D007	F999
LIC Refractory (hazardous)	Produced during refractory changeout.	D007	F999
DFS HDC Ash (hazardous)	Produced during the incineration of munitions.	D006, D008	F999
DFS Cyclone Residue	Produced during the incineration of munitions.	D006, D007, D008	F999
DFS Refractory	Produced during refractory changeout.	N/A	F999
Brine Salts (hazardous)	Produced during the drying of scrubber brine.	D006, D007, D008	F999
Brine Tank Sludge (hazardous)	Produced during the cleanout of tanks that store scrubber brine.	D006, D007, D008	F999
BRA Baghouse Residue (hazardous)	Residue collected from baghouse.	D006, D007, D008	F999
Waste Citric Acid	Generated during the cleaning of the brine reduction evaporators and PAS.	D006, D007	F999
Waste Hydrochloric Acid	Generated during the cleaning of the brine reduction evaporators and PAS.	D006, D007	F999
Demister Filters (hazardous)	Produced during the changeout of demister filters.	D006, D008	F999
PAS Quench Tower Residue	Produced during the cooling of the off-gas.	N/A	F999
PAS Sump Sludge (hazardous)	Generated during the cleanout of the PAS sumps.	D005, D006, D007, D008, D011	F999
RHA Baghouse Residue	Residue collected from baghouse.	D006, D008	F999
Decontamination- Neutralization Solutions	Produced from site decontamination and laboratory operations.	D002, D008, D018, D022, F002, F003, F005	F999
Waste Heavy Metal Solution - Acidic, Oxidizing	Generated at the Laboratory.	D001, D002, D004, D006, D007, D008, D009, D010	F999
Waste Acid Solution	Generated at the Laboratory.	D002	F999
Waste Organic Solvents	Generated at the Laboratory.	D001, F002, F003, F005	F999
DPE Suits	Generated during toxic operations.	D003	F999/P999
Wood Pallets	Produced during the unpacking of ONCs and munitions.	N/A	F999/P999
Spent Activated Carbon	Produced during the changeout of carbon filters.	D003	F999, P999
Miscellaneous Metal Parts	Worn out equipment and parts.	D006, D008	F999
Clean-up Materials	Miscellaneous materials generated during the decontamination and maintenance of the plant.	N/A	F999
Incinerator Byproducts	Byproducts from maintenance activities.	D007	F999
Spent Hydraulic Fluid	Produced during maintenance activities.	N/A	F999
Waste Oil	Produced during maintenance activities.	F001, F002, D001	F999
Waste Paint Liquids	Produced during maintenance activities.	D001, D005, D007, D008, F002, F003, F005	F999
Waste Paint Solids	Produced during maintenance activities.	D007, D008, F002, F003, F005	F999
Spill Cleanup Materials	Generated during single substance spill response cleanup.	N/A	F999
Trash, Debris, & PPE	Produced during maintenance activities.	D003	P999/F999
BRA Baghouse Debris	Produced during maintenance activities	D007	P999/F999
Broken Fluorescent Lightbulbs	Produced during maintenance activities	D009	
CAL Lab Liquids	Miscellaneous materials generated after decontamination activities	D001, D002, D022	F999
CAL Lab Solids	Miscellaneous materials generated after decontamination activities	F003, F005,	F999
Cardboard Rocket Ash	Generated during rocket processing		F999

Table 2-2: Site-Generated Waste Streams			
Waste Stream	**Description**	**EPA Waste Codes[1]**	**Utah Waste Code**
DFS Demister Candle Packing	Produced during change out of demister candles		P999
Flammable Aerosols	Off-spec/expired shelf life material	D001, D007, D008, D035, D039	
Flammable Labpacks	Off-spec/expired shelf life material	D001	P999, F999
IPA/Glycol	Surrogate during systemizataion of plant equipment	D001	F999
Lab acids	Off-spec/expired shelf life material	D001, D002, D006, D008, D019, D022, F003	F999
Lab Solvents	Off-spec/expired shelf life material	D001, D002, F003, U080	F999
Lead Acid Batteries	Battery Change out	D002, D008	F999
Lithium Batteries	Battery Change out	D003	F999
M40 Cannisters	Generated during toxic operations		F999, P999
Monitoring Solids	Discarded monitoring and sampling equipment.		F999, P999
MPF Brick	MPF refractory replacement	D007	F999
MPF Vacuum Ash	Residue removed from MPF burn trays and munitions.	D006, D007, D008	F999
MSB Cleaning Solutions	Cleaning of sampling equipment		F999
NiCad Batteries	Battery Change out	D006,	F999
PAS Piping	PAS piping repairs and replacements		F999, P999
PAS Solids	Solids collected in PAS filters and removed from quench towers and scrubbers	D006, D007, D008	F999, P999
Sodium Lamps	Light Bulb replacement	D005, D008, D009	F999, P999
Spent IPA	Cleaning ACAMS equipment	D001	F999, P999
Spent Scrubber Brine	Generated from incineration operation	D004, D007, D008	F999, P999
Sump 110 Sludge	Sump 110 clean out		F999, P999
Tap Gear	Generated during toxic operations		F999, P999

Footnotes:
1. The waste codes are determined during analysis. Additional waste codes may apply.

Table 2-3: Analytical Method Descriptions	
Method	**Description/Title**
SW-846 1010	Pensky – Martens Closed-Cup Method for Determining Ignitability
SW-846 1020A	Setaflash Closed-Cup Method for Determining Ignitability
SW-846 1311	Toxicity Characteristic Leaching Procedure.
SW-846 3010A	Acid Digestion of Aqueous Samples and Extracts for Total Metals for Analysis by FLAA or ICP Spectroscopy.
SW-846 3050B	Acid Digestion of Sediments, Sludges, and Soils.
SW-846 3510C	Separatory Funnel Liquid-Liquid Extraction.
SW-846 3520C	Continuous Liquid-Liquid Extraction.
SW-846 3541	Automated Soxhlet Extraction
SW-846 3540C	Soxhlet Extraction
SW-846 3580A	Waste Dilution.
SW-846 5030B	Purge and Trap
SW-846 6010B	Inductively Coupled Plasma - Atomic Emission Spectroscopy.
SW-846 6020	Inductively Coupled Plasma-Mass Spectrometry
SW-846 7470A	Mercury in Liquid Waste (Manual Cold-Vapor Technique).
SW-846 7471A	Mercury in Solid or Semisolid Waste (Manual Cold-Vapor Technique)
SW-846 8260B	Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS): Capillary Column Technique.
SW-846 8270C	Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS): Capillary Column Technique.
SW-846 8290	Polychlorinated Dibenzodioxins (PCDDs) and Polychlorinated Dibenzofurans (PCDFs) by High Resolution Gas Chromato-graphy/High-Resolution Mass Spectrometry (HRGC/HRMS)
SW-846 8330	Nitroaromatics and Nitramines by High Performance Liquid Chromatography (HPLC)
SW-846 8332	Nitroglycerine by High Performance Liquid Chromatography
SW-846 9040B	pH Electrometric Measurement.
SW-846 9095A	Paint Filter Liquids Test
SW-846 8082	Polychlorinated Biphenyls (PCBs) by Capillary Column Gas Chromatography
EPA 160.1	Total Dissolved Solids (TDS).
EPA 160.2	Total Suspended Solids (TSS).
TE-LOP-557	Analysis of Metals by Inductively Coupled Plasma-Mass Spectrometry (ICP-MS)
TE-LOP-572	Extractions/Analyses Including: WCL Extraction of GB for the Metals Diluent Solution; DWS Extraction of VX and HD; Extraction of GB, HD, and VX from Hydraulic Fluid; Analysis of GB, HD, and VX in Lubricating Oils; Analysis of GB, HD, and VX in Organic Wastes; and Extraction of GB, HD, and VX from Wood.
TE-LOP-574	Special Analyses Including: Specific Gravity Measurements.
TE-LOP-584	Neat Agent OPS/GC Including: GC-FID and GC-MSD Analyses of Agent Samples to Determine Agent Purity.

Table 2-4 Agent Contaminated Waste That May Be Treated in The MPF	
Waste Stream and Quantity (if Applicable)	**Waste Code**(s)
Assorted Parts/Material Conveyors Chains, Rollers, Links Gears, Bearings, Bushings Wheels, Idlers Gearboxes Gasket Materials (non-combustible) Seals (non-combustible) Pre-filters and HEPA filters Carbon Adsorber Trays (from which carbon has been removed) Collets Drain Probes Crimp Jaws and Pins Bore Station Blades Turntable Projectile Bushings Projectile Pickup Heads Shear Blades Punches Pusher Assemblies Paper, Cloth, Pads, Pillows, Spill Adsorbents (Cellulose/polypropylene) (Maximum, 28 lbs/charge for a single charge at 20,000 BTU/lb at 1450° F) (Maximum 16 lbs/charge for consecutively charged trays containing paper, cloth, pads, pillows and spill absorbents, at 20,000 BTU/lb at 1450° F) Jaw Gripper Assemblies Projectile Cans Hoists	P999[1]
Electrical Components Motors Conduit (Metal) Solenoids Switches (Safety, Limit, Light) Light Fixtures, maximum of 20 units per furnace charge	P999[1]
Plumbing Materials Pumps Piping/Fittings/Tubing (metal) Chemical Seals Hydraulic Motors Hydraulic Cylinders Hydraulic Tubing/Fittings (metal) Hydraulic Hose/Fittings (metal) Plumbing Materials (cont'd)	P999[1] P999[1]

Table 2-4 Agent Contaminated Waste That May Be Treated in The MPF	
Waste Stream and Quantity (if Applicable)	**Waste Code**(s)
Pressure Regulators Flow Control Valves Pneumatic Actuators Accumulator Bladders Filter Cartridges/Elements and associated residue/cleanup material (includes AQS/ACS filter elements) Spray Nozzles Pipe Gaskets Valves (Hand, Solenoid, Agent, Decon, Hydraulic)	
Instrumentation Test Equipment (Meters, Gauges, Etc.) Sensors, Transmitters, and Transducers Flow, Pressure, and Proximity Switches Pressure Gauges Cameras or Camera Parts Load Cells Speakers Low Volume Agent Samplers Thermocouples and Thermolwells	P999[1]
Assorted Solids Hand Tools Grating Metal Buckets, Pans, and Barrels Metal Brackets, Stands, Fixtures, Etc Escape Air Tank, Mask, and Regulators Scrub Brushes Banding Material Empty Overpacks/Drums (Non-Combustible) Monitoring Sample Probes (DAAMS Tubes, etc.) Silicone material/parts Glassware Plaster Paint Brushes, Rollers, and Pans Empty Paint and Lubricant Spray Cans (Punched), maximum 25 units per furnace charge Personal Protective Equipment (non-combustible) DPE Leather Over Garments, maximum 10 units per furnace charge Plastic bags used to contain contaminated wastes, a maximum of 1.0 lb per furnace charge	P999[1]
[1] In addition to the P999 waste code, the above mentioned waste streams may carry the following waste codes: F999, D002, D004, D005, D006, D007, D008, D009, D010, and D011.	

Table 2-A-1 CHEMICAL AGENT PHYSICAL PROPERTIES					
PROPERTY	**GB**	**VX**	**H**	**HD**	**HT**
Chemical Name	Isopropyl methyl-phosphonofluoridate (Sarin)	O-ethyl-S[2-(diisopropyl-amino)ethyl] methylphosphonothiolate	Same as HD with up to 25% impurities	Bis(2-chloroethyl) sulfide or 2,2'-dichlorodiethyl sulfide (sulfur mustard)	Same as HD with 40% T Bis[2(-chloroethylthio) ethyl] ether
Chemical formula	$C_4H_{10}FO_2P$	$C_{11}H_{26}NO_2PS$	$C_4H_8Cl_2S_{1.5}$	$C_4H_8Cl_2S$	$C_{5.15}H_{10.3}Cl_{2.0}O_{0.29}S_{1.29}$
Molecular weight	140.0951	267.37262	175.11016	159.07816	189.14764
Vapor specific gravity (air = 1.00)	4.86	9.2	5.4	5.4	6.92
Liquid density at 77° F[1] (lb/ft^3)	67.965	62.93	79.49	79.49	79.49
Freezing point (° F)	-69	Below -60	41 to 57	58	32 to 34.3
Boiling Point (°F)	316	572	437	423	442
Vapor pressure at 77°F[1] (mm Hg)	2.9	0.00063	0.059	0.11	0.104
Flash Point (° F)	Does not flash	318	212	221	212
Viscosity (centistokes) at 77° F [1]	1.28	9.96 (pure); may be substantially higher if partially decomposed	3.95	3.95	6.05
Color	Clear to straw to amber	Clear to straw	Amber-dark brown liquid		
Odor	None	None	Garlic		
Special properties	None		Permeates ordinary rubber		
Solubility properties	Miscible with water and readily soluble in all organic solvents	Best solvents are dilute mineral acids	Water (distilled), 0.092 g/100 cc at 72° F; completely soluble in acetone, CCl_4,CH_3Cl, tetrachloroethane, ethyl benzoate, ether)		
High heating value (Btu/lb at 60° F)	10073	15174	8100	8500	9,400
Physical state	Viscous liquid				

[1] Agents H and HT are at 68° F.

Table 2-A-2
CHEMICAL AGENT COMPOSITION

AGENT	CHEMICAL CONSTITUENT	Minimum Value (Wt%)	Maximum Value (Wt%)
GB	**Isopropyl methyl phosphonofluoridate (GB Agent)**	37	97
	N,N'-Diisopropylcarbodiimide (DICDI)	0	1.9
	Tributylamine (TBA)	1	9.5
	Methylphosphonofluoridic acid (MPA)[1]	0	8.35
	Diisopropyl methylphosphonate (DIMP)	0.9	27
	Methylphosphonofluoridic acid (MPFA) [1]	2.6	13.65
	Diispropyl urea (DIU)	0	2.4
	Diethyl methyl phosphonate (DEMP)	0.6	0.6
	Isopropylmethylphosphonic acid (IMPA) [1]	0.05	25.8
	Fluoride (F) [1]	0.1	2.8
	Density (g/ml)	1	1.2
	Metals	**Minimum (mg/kg)**	**Maximum (mg/kg)**
	Aluminum	4.7	3205
	Antimony	0.04	154
	Arsenic	0.72	556
	Barium	0.0094	40
	Beryllium	0.002	1
	Boron	1.1	4585
	Cadmium	0.011	7.9
	Chromium	0.72	54
	Cobalt	0.07	10.9
	Copper	0.25	120
	Iron	18	4855
	Lead	0.092	801
	Manganese	0.13	110
	Mercury	0.0061	9.1
	Nickel	0.72	415
	Selenium	<0.5	92
	Silver	0.004	13
	Thallium	<.14	154
	Tin	0.15	308
	Vanadium	0.33	10

Note:
1. The parameter is analyzed if the mass balance of the initial agent organic analysis is found to be 80% or less.

Table 2-A-2
CHEMICAL AGENT COMPOSITION

AGENT	CHEMICAL CONSTITUENT	Minimum Value (Wt%)	Maximum Value (Wt%)
VX[1]	**O-ethyl, S-[2-(diisopropylamino)ethyl] methylphosphonthiolate (VX Agent)**	59.6	96.7
	Ethyl methylphosphonic acid (EMPA)[2]	0.460	5.42
	N,N'-Dicyclohexylcarbodiimide (DCC or DCHCDI)	0.02	4.15
	bis(2-Diisopropylaminoethyl) disulfide (KM or EA 4196)[3]	0.60	2.3
	N,N'-Diisopropylcarbodiimide (DICDI)	ND	2.20
	S-(2-Diisopropylaminoethyl)methylphosponothioic acid (EA 2192)[3]	0.11	0.34
	bis(2-Diisopropylaminoethyl) sulfide (KK)	0.2	0.4
	Diethyl methylphosphonate (DEMP)	0.02	0.18
	Methylphosphonic acid (MPA)[2]	ND	ND
	Chlorine	0.306	0.514
	Metals	**Minimum (mg/kg)**	**Maximum (mg/kg)**
	Aluminum	1.5	1.8
	Antimony		ND
	Arsenic	ND	78
	Barium	ND	1.0
	Beryllium		ND
	Boron		ND
	Cadmium		ND
	Chromium	ND	12
	Cobalt		ND
	Copper	ND	6.7
	Iron	6.9	53
	Lead	ND	6.5
	Manganese		ND
	Mercury	ND	0.78
	Nickel		ND
	Selenium	ND	44
	Silver		ND
	Thallium		ND
	Tin		ND
	Vanadium	2.9	3.3
	Zinc	0.9	10.9

Notes:
1. Data are taken from the Bulk Agent Stockpile Survey Report and 2001 Agent VX Characterization.
2. The parameter is analyzed if the mass balance of the initial agent organic analysis is found to be less than 85%.
3. The parameter is analyzed during shakedown and trial burn sampling only.
ND = Not Detected

Table 2-A-2
CHEMICAL AGENT COMPOSITION

AGENT	CHEMICAL CONSTITUENT	Minimum Value (Wt%)	Maximum Value (Wt%)
HD[2]	**Bis (2-chloroethyl) sulfide (HD Agent)**	TBD	TBD
	1,2-Bis(2-chloroethylthio)ethane	TBD	TBD
	Bis[2-(2-chloroethylthio)ethyl]ether	TBD	TBD
	1,2,-Dichloroethane	TBD	TBD
	1-(2-Chloroethoxy)-2-(2-chloroethylthio)ethane	TBD	TBD
	2-Chloroethyl ?-chlorobutyl sulfide (mixed isomers)	TBD	TBD
	1,2-Dichloroethane[3]	TBD	TBD
	Trichloroethylene[3]	TBD	TBD
	Thiodiglycol[1,3]	TBD	TBD
	Tetrachloroethylene[3]	TBD	TBD
	1,1,2,2-Tetrachloroethane[3]	TBD	TBD
	Hexachloroethane[3]	TBD	TBD
	Metals	**Minimum (mg/kg)**	**Maximum (mg/kg)**
	Aluminum	TBD	TBD
	Antimony	TBD	TBD
	Arsenic	TBD	TBD
	Barium	TBD	TBD
	Beryllium	TBD	TBD
	Boron	TBD	TBD
	Cadmium	TBD	TBD
	Chromium	TBD	TBD
	Cobalt	TBD	TBD
	Copper	TBD	TBD
	Iron	TBD	TBD
	Lead	TBD	TBD
	Manganese	TBD	TBD
	Mercury	TBD	TBD
	Nickel	TBD	TBD
	Selenium	TBD	TBD
	Silver	TBD	TBD
	Thallium	TBD	TBD
	Tin	TBD	TBD
	Vanadium	TBD	TBD
	Zinc	TBD	TBD

Notes:
1. The parameter is analyzed if the mass balance of the initial agent organic analysis is found to be 80% or less.
2. H and HT contain the same active ingredient and impurities shown for HD but in different proportions. HD contains the highest weight percent of the active ingredient bis (2-chloroethyl) sulfide.
3. Impurities found in ton containers of mustard in Aberdeen, Occupational Health and Workplace Monitoring at Chemcial Agent Disposal Facilities, NRC, 2001 (Munro,N.B.et al., 1999, The Sources, Fate and Toxicity of Chemical Warfare Agent Degradation Products, Environmental Health Perspectives 107(12): 933-974)

TBD = To Be Determined

TABLE 2-B-1
Metals in Munitions (Metals with Feed Rate Limitations - Module V)

Metals (lb)	Sb	As	Ba	Be	Cd	Cr	Pb	Hg	Ag	Tl
4.2" Cartridge (M2), Agent HT, Surface Area = 1.88 sq. ft.										
Metals in Munition Metal (embedded)	NR	NR	NR	NR	0.00044	0.04676	NR	NR	NR	NR
Metals in Energetic	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Metals in Paint	NR	NR	0.01824	NR	0.0094	0.00526	0.0329	NR	NR	NR
TOTAL (lb, non-embedded)	**NR**	**NR**	**0.01824**	**NR**	**0.0094**	**0.00526**	**0.0329**	**NR**	**NR**	**NR**
4.2" Cartridge (M2A1), Agent HD, Surface Area = 1.88 sq. ft.										
Metals in Munition Metal (embedded)	NR	NR	NR	NR	0.00044	0.04676	NR	NR	NR	NR
Metals in Energetic	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Metals in Paint	NR	NR	0.01824	NR	0.0094	0.00526	0.0329	NR	NR	NR
TOTAL (lb, non-embedded)	**NR**	**NR**	**0.01824**	**NR**	**0.0094**	**0.00526**	**0.0329**	**NR**	**NR**	**NR**

1. The metals within the munitions metal are considered to be fixed (embedded, inert) and will not vaporize and are therefore not included in the above totals.
2. No distinction between different chromium valences (e.g., identification of hexavalent chrome) can be made from the available information.
3. NR-Not reported, no data provided.

TABLE 2-B-1
Metals in Munitions (Metals with Feed Rate Limitations - Module V)

Metals (lb)	Sb	As	Ba	Be	Cd	Cr	Pb	Hg	Ag	Tl
155 MM Projectile (M104 and M110), Agent H, Surface Area = 2.9 sq. ft.										
Metals in Munition Metal (embedded)	NR	NR	NR	NR	NR	0.21698	NR	NR	NR	NR
Metals in Energetic (burster)										
Metals in Paint			0.02813		0.0145	0.00812	0.05075			
TOTAL (lb, non-embedded)			**0.02813**		**0.0145**	**0.00812**	**0.05075**			**0**
155 MM Projectile (M121/A1 And M122), Agent GB, Surface Area = 2.9 sq. ft.										
Metals in Munition Metal (embedded)	NR	NR	NR	NR	NR	3.6	NR	NR	NR	NR
Metals in Energetic	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Metals in Paint	NR	NR	0.02813	NR	0.0145	0.00812	0.05075	NR	NR	NR
TOTAL (lb, non-embedded)	NR	NR	**0.02813**	NR	**0.0145**	**0.00812**	**0.05075**	NR	NR	NR
155 MM Projectile (M121/A1), Agent VX, Surface Area = 2.9 sq. ft.										
Metals in Munition Metal (embedded)	NR	NR	NR	NR	NR	3.6	NR	NR	NR	NR
Metals in Energetic	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Metals in Paint	NR	NR	0.02813	NR	0.0145	0.00812	0.05075	NR	NR	NR
TOTAL (lb, non-embedded)	NR	NR	**0.02813**	NR	**0.0145**	**0.00812**	**0.05075**	NR	NR	NR

1. The metals within the munitions metal are considered to be fixed (embedded, inert) and will not vaporize and are therefore not included in the above totals.
2. No distinction between different chromium valences (e.g., identification of hexavalent chrome) can be made from the available information.
3. NR –Not reported, no data reported.

TABLE 2-B-1
Metals in Munitions (Metals with Feed Rate Limitations - Module V)

Metals (lb)	Sb	As	Ba	Be	Cd	Cr	Pb	Hg	Ag	Tl
Ton Containers, Agent HD, Surface Area = 65.75 sq. ft.										
Metals in Fusible Plugs	NR	NR	NR	NR	NR	NR	1.684	NR	NR	NR
Metals in Paint	NR	NR	0.63778	NR	0.32875	0.1841	1.15062	NR	NR	NR
TOTAL (lb, non-embedded)	NR	NR	**0.63778**	NR	**0.32875**	**0.1841**	**2.83462**	NR	NR	NR
Ton Containers, Agent GB, Surface Area = 65.75 sq. ft.										
Metals in Fusible Plugs	NR	NR	NR	NR	NR	NR	1.684	NR	NR	NR
Metals in Paint	NR	NR	0.63778	NR	0.32875	0.1841	1.15062	NR	NR	NR
TOTAL (lb, non-embedded)	NR	NR	**0.63778**	NR	**0.32875**	**0.1841**	**2.83462**	NR	NR	NR
Ton Containers, Agent VX, Surface Area = 65.75 sq. ft.										
Metals in Fusible Plugs	NR	NR	NR	NR	NR	NR	1.684	NR	NR	NR
Metals in Paint	NR	NR	0.63778	NR	0.32875	0.1841	1.15062	NR	NR	NR
TOTAL (lb, non-embedded)	NR	NR	**0.63778**	NR	**0.32875**	**0.1841**	**2.83462**	NR	NR	NR

1. The ton containers are constructed of carbon steel. Any metals associated with the steel are considered to be fixed (embedded, inert) and will not vaporize and are therefore not included in the above totals.
2. The fusible plugs associated with the ton containers melt at 108 ^{o}C. Therefore the associated metals are assumed to be non-embedded and are included in the above totals.
3. No distinction between different chromium valences (e.g., identification of hexavalent chrome) can be made from the available information.
4. Weight and composition of brass valve associated with ton containers is unknown and therefore is not included in the above values (embedded and would not affect totals).
5. NR-not reported, no information provided.

TABLE 2-B-1
Metals in Munitions (Metals with Feed Rate Limitations - Module V)

Metals (lb)	Sb	As	Ba	Be	Cd	Cr	Pb	Hg	Ag	Tl
105 MM Cartridge (M360), Agent GB, Surface Area = 2.8 sq. ft.										
Metals in Munition Metal including fuze (embedded)	NR	NR	NR	NR	0.00044	1.21681	NR	NR	NR	NR
Metals in Energetic (burster)	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Metals in Paint	NR	NR	0.02721	NR	0.01402	0.00785	0.04908	NR	NR	NR
TOTAL (lb, non-embedded)	NR	NR	**0.02721**	NR	**0.01402**	**0.00785**	**0.04908**	NR	NR	**NR**
105 MM Projectile (M360), Agent GB, Surface Area = 2.8 sq. ft.										
Metals in Munition Metal (embedded)	NR	NR	NR	NR	NR	1.2148	NR	NR	NR	NR
Metals in Paint	NR	NR	0.02721	NR	0.01402	0.00785	0.04908	NR	NR	NR
TOTAL (lb, non-embedded)	NR	NR	**0.02721**	NR	**0.01402**	**0.00785**	**0.04908**	NR	NR	NR

1. The metals within the munitions metal are considered to be fixed (embedded, inert) and will not vaporize and are therefore not included in the above totals.
2. No distinction between different chromium valences (e.g., identification of hexavalent chrome) can be made from the available information.
3. The primer, propelling charge, and cartridge case associated with the 105 MM Cartridge are not processed at the TOCDF and are therefore not included in the above totals.
4. NR-not reported, not information provided.

TABLE 2-B-1
Metals in Munitions (Metals with Feed Rate Limitations - Module V)

Metals (lb)	Sb	As	Ba	Be	Cd	Cr	Pb	Hg	Ag	Tl
115 MM Rocket (M55), Agent GB, Surface Area = 7.93 sq. ft.										
Metals in Munition Metal (embedded)	NR	NR	NR	NR	0.000439	0.00201	NR	NR	NR	NR
Metals in Energetic	0.000005	NR	0.000005	NR	NR	NR	0.1032	NR	NR	NR
Metals in Paint	NR	NR	0.07692	NR	0.03965	0.02220	0.1388	NR	NR	NR
TOTAL (lb, non-embedded)	**0.000005**	**NR**	**0.076925**	**NR**	**0.03965**	**0.02220**	**0.2420**	**NR**	**NR**	**NR**
115 MM Rocket Warhead (M56), Agent GB, Surface Area = 2.6 sq. ft.										
Metals in Munition Metal (embedded)	NR	NR	NR	NR	0.000439	0.00201	NR	NR	NR	NR
Metals in Energetic	0.000005	NR	0.000005	NR	NR	NR	0.00021	NR	NR	NR
Metals in Paint	NR	NR	0.02564	NR	0.01322	0.00740	0.04626	NR	NR	NR
TOTAL (lb, non-embedded)	**0.000005**	**NR**	**0.025645**	**NR**	**0.01322**	**0.00740**	**0.04647**	**NR**	**NR**	**NR**

1. The metals within the munitions metal are considered to be fixed (embedded, inert) and will not vaporize and are therefore not included in the above totals.
2. One third of the M55 Rocket surface area is assumed to be associated with the warhead for the calculation of the warhead surface area.
3. No distinction between different chromium valences (e.g., identification of hexavalent chrome) can be made from the available information.
4. The rocket warhead is constructed of an aluminum casing (95% Al, 5% Cu). The casing is assumed to weigh 10.8 lbs for the above calculations.
5. NR-not reported, no information provided.

TABLE 2-B-1
Metals in Munitions (Metals with Feed Rate Limitations - Module V)

Metals (lb)	Sb	As	Ba	Be	Cd	Cr	Pb	Hg	Ag	Tl
115 MM Rocket (M55), Agent VX, Surface Area = 7.93 sq. ft.										
Metals in Munition Metal (embedded)	NR	NR	NR	NR	0.000439	0.00201	NR	NR	NR	NR
Metals in Energetic	0.000005	NR	0.000005	NR	NR	NR	0.1032	NR	NR	NR
Metals in Paint	NR	NR	0.07692	NR	0.03965	0.02220	0.1388	NR	NR	NR
TOTAL (lb, non-embedded)	**0.000005**	**NR**	**0.076925**	**NR**	**0.03965**	**0.02220**	**0.2420**	**NR**	**NR**	**NR**
115 MM Rocket Warhead (M56), Agent VX, Surface Area = 2.6 sq. ft.										
Metals in Munition Metal (embedded)	NR	NR	NR	NR	0.000439	0.00201	NR	NR	NR	NR
Metals in Energetic	0.000005	NR	0.000005	NR	NR	NR	0.00021	NR	NR	NR
Metals in Paint	NR	NR	0.02564	NR	0.01322	0.00740	0.04626	NR	NR	NR
TOTAL (lb, non-embedded)	**0.000005**	**NR**	**0.025645**	**NR**	**0.01322**	**0.00740**	**0.04647**	**NR**	**NR**	**NR**

1. The metals within the munitions metal are considered to be fixed (embedded, inert) and will not vaporize and are therefore not included in the above totals.
2. One third of the M55 Rocket surface area is assumed to be associated with the warhead for the calculation of the warhead surface area.
3. No distinction between different chromium valences (e.g., identification of hexavalent chrome) can be made from the available information.
4. The rocket warhead is constructed of an aluminum casing (95% Al, 5% Cu). The casing is assumed to weigh 10.8 lbs for the above calculations.
5. NR-not reported, no information provided.

TABLE 2-B-1
Metals in Munitions (Metals with Feed Rate Limitations - Module V)

Metals (lb)	Sb	As	Ba	Be	Cd	Cr	Pb	Hg	Ag	Tl
Weteye Bomb (MK-116), Agent GB, Surface Area = 28.4 sq. ft.										
Metals in Paint	NR	NR	0.27553	NR	0.14203	0.07953	0.49709	NR	NR	NR
TOTAL (lb, non-embedded)	**NR**	**NR**	**0.27553**	**NR**	**0.14203**	**0.07953**	**0.49709**	**NR**	**NR**	**NR**

1. The metals within the munitions metal are unknown, not estimated, and considered to be embedded and are not included in the above totals.
2. No distinction between different chromium valences (e.g., identification of hexavalent chrome) can be made from the available information.
3. NR-not reported, no information provided.

TABLE 2-B-1
Metals in Munitions (Metals with Feed Rate Limitations - Module V)

Metals (lb)	Sb	As	Ba	Be	Cd	Cr	Pb	Hg	Ag	Tl
Mine (M23), Agent VX, Surface Area = 3.5 sq. ft.										
Metals in Energetic	0.00003	NR	NR	NR	NR	NR	0.00044	NR	NR	NR
Metals in Paint	NR	NR	0.03357	NR	0.01730	0.00969	0.06056	NR	NR	NR
TOTAL (lb, non-embedded)	**0.00003**	**NR**	**0.03357**	**NR**	**0.01730**	**0.00969**	**0.06100**	**NR**	**NR**	**NR**
Spray Tank (TMU-28), Agent VX, Surface Area = 91.1 sq. ft.										
Metals in Paint	NR	NR	0.88325	NR	0.45529	0.25496	1.59350	NR	NR	NR
Metals in Ballast	NR	NR	NR	NR	NR	NR	81.0	NR	NR	NR
TOTAL (lb, non-embedded)	**NR**	**NR**	**0.88325**	**NR**	**0.45529**	**0.25496**	**1.59350**	**NR**	**NR**	**NR**

1. The metals within the mine and spray tank metal are unknown, not estimated, and considered to be fixed (embedded, inert) and will not vaporize and are therefore not included in the above totals.
2. No distinction between different chromium valences (e.g., identification of hexavalent chrome) can be made from the available information.
3. NR-not reported, no information provided.

TABLE 2-B-2
Metals in Munitions (Other Metals of Interest)

Metals (lb)	Se	Ni	V	Al	B	Co	Cu	Mn	Sn	Zn
4.2" Cartridge (M2), Agent HT, Surface Area = 1.88 sq. ft.										
Metals in Munition Metal (embedded)	NR	0.0895	NR	NR	NR	NR	NR	0.1253	NR	NR
Metals in Energetic	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Metals in Paint	NR	0.0094	NR	NR	NR	NR	NR	NR	NR	NR
TOTAL (lb, non-embedded)	**NR**	**0.0094**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**
4.2" Cartridge (M2A1), Agent HD, Surface Area = 1.88 sq. ft.										
Metals in Munition Metal (embedded)	NR	0.0895	NR	NR	NR	NR	NR	0.1253	NR	NR
Metals in Energetic	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Metals in Paint	NR	0.0094	NR	NR	NR	NR	NR	NR	NR	NR
TOTAL (lb, non-embedded)	**NR**	**0.0094**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**

1. The metals within the munitions metal are considered to be fixed (embedded, inert) and will not vaporize and are therefore not included in the above totals.
2. NR-not reported, no information provided.

TABLE 2-B-2
Metals in Munitions (Other Metals of Interest)

Metals (lb)	**Se**	**Ni**	**V**	**Al**	**B**	**Co**	**Cu**	**Mn**	**Sn**	Zn
155 MM Projectile (M104 and M110), Agent H, Surface Area = 2.9 sq. ft.										
Metals in Munition Metal (embedded)	NR	0.43395	NR	NR	NR	NR	NR	0.60753	NR	NR
Metals in Energetic (burster)	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Metals in Paint	NR	0.0145	NR	NR	NR	NR	NR	NR	NR	NR
TOTAL (lb, non-embedded)	**NR**	**0.0145**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**
155 MM Projectile (M121/A1 And M122), Agent GB, Surface Area = 2.9 sq. ft.										
Metals in Munition Metal (embedded)	NR	0.45	NR	NR	NR	NR	0.45	0.495	NR	NR
Metals in Energetic	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Metals in Paint	NR	0.0145	NR	NR	NR	NR	NR	NR	NR	NR
TOTAL (lb, non-embedded)	**NR**	**0.0145**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**
155 MM Projectile (M121/A1), Agent VX, Surface Area = 2.9 sq. ft.										
Metals in Munition Metal (embedded)	NR	0.45	NR	NR	NR	NR	0.45	0.495	NR	NR
Metals in Energetic	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Metals in Paint	NR	0.0145	NR	NR	NR	NR	NR	NR	NR	NR
TOTAL (lb, non-embedded)	**NR**	**0.0145**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**

1. The metals within the munitions metal are considered to be fixed (embedded, inert) and will not vaporize and are therefore not included in the above totals.
2. NR-not reported, no information provided.

TABLE 2-B-2
Metals in Munitions (Other Metals of Interest)

Metals (lb)	Se	Ni	V	Al	B	Co	Cu	Mn	Sn	Zn
Ton Containers, Agent HD, Surface Area = 65.75 sq. ft.										
Metals in Fusible Plugs	NR	NR	NR	NR	NR	NR	NR	NR	0.632	NR
Metals in Paint	NR	0.32875	NR	NR	NR	NR	NR	NR	NR	NR
TOTAL (lb, non-embedded)	**NR**	**0.32875**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**0.632**	**NR**
Ton Containers, Agent GB, Surface Area = 65.75 sq. ft.										
Metals in Fusible Plugs	NR	NR	NR	NR	NR	NR	NR	NR	0.632	NR
Metals in Paint	NR	0.32875	NR	NR	NR	NR	NR	NR	NR	NR
TOTAL (lb, non-embedded)	**NR**	**0.32875**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**0.632**	**NR**
Ton Containers, Agent VX, Surface Area = 65.75 sq. ft.										
Metals in Fusible Plugs	NR	NR	NR	NR	NR	NR	NR	NR	0.632	NR
Metals in Paint	NR	0.32875	NR	NR	NR	NR	NR	NR	NR	NR
TOTAL (lb, non-embedded)	**NR**	**0.32875**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**0.632**	**NR**

1. The ton containers are constructed of carbon steel. Any metals associated with the steel are considered to be fixed (embedded, inert) and will not vaporize and are therefore not included in the above totals.
2. The fusible plugs associated with the ton containers melt at 108 ^{o}C. Therefore the associated metals are assumed to be non-embedded and are included in the above totals.
3. Weight and composition of brass valve associated with ton containers is unknown and therefore is not included in the above values (embedded and would not affect totals).
4. NR-not reported, no information provided.

TABLE 2-B-2
Metals in Munitions (Other Metals of Interest)

Metals (lb)	Se	Ni	V	Al	B	Co	Cu	Mn	Sn	Zn
105 MM Cartridge (M360), Agent GB, Surface Area = 2.8 sq. ft.										
Metals in Munition Metal including fuze (embedded)	NR	0.15185	NR	NR	NR	NR	0.15185	0.16703	NR	NR
Metals in Energetic (burster)	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Metals in Paint	NR	0.01402	NR	NR	NR	NR	NR	NR	NR	NR
TOTAL (lb, non-embedded)	**NR**	**0.01402**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**
105 MM Projectile (M360), Agent GB, Surface Area = 2.8 sq. ft.										
Metals in Munition Metal (embedded)	NR	0.15185	NR	NR	NR	NR	0.15185	0.16703	NR	NR
Metals in Paint	NR	0.01402	NR	NR	NR	NR	NR	NR	NR	NR
TOTAL (lb, non-embedded)	**NR**	**0.01402**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**

1. The metals within the munitions metal are considered to be fixed (embedded, inert) and will not vaporize and are therefore not included in the above totals.
2. The primer, propelling charge, and cartridge case associated with the 105 MM Cartridge are not processed at the TOCDF and are therefore not included in the above totals.
3. NR-not reported, no information provided.

TABLE 2-B-2
Metals in Munitions (Other Metals of Interest)

Metals (lb)	Se	Ni	V	Al	B	Co	Cu	Mn	Sn	Zn
115 MM Rocket (M55), Agent GB, Surface Area = 7.93 sq. ft.										
Metals in Munition Metal (embedded)	NR	NR	NR	10.26	NR	NR	0.54	NR	NR	NR
Metals in Energetic	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Metals in Paint	NR	0.03965	NR	NR	NR	NR	NR	NR	NR	NR
TOTAL (lb, non-embedded)	**NR**	**0.03965**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**
115 MM Rocket Warhead (M56), Agent GB, Surface Area = 2.6 sq. ft.										
Metals in Munition Metal (embedded)	NR	NR	NR	10.26	NR	NR	0.54	NR	NR	NR
Metals in Energetic	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Metals in Paint	NR	0.01322	NR	NR	NR	NR	NR	NR	NR	NR
TOTAL (lb, non-embedded)	**NR**	**0.01322**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**

1. The metals within the munitions metal are considered to be fixed (embedded, inert) and will not vaporize and are therefore not included in the above totals.
2. One third of the M55 Rocket surface area is assumed to be associated with the warhead for the calculation of the warhead surface area.
3. The rocket warhead is constructed of an aluminum casing (95% Al, 5% Cu). The casing is assumed to weigh 10.8 lbs for the above calculations.
4. NR-not reported, no information provided.

TABLE 2-B-2
Metals in Munitions (Other Metals of Interest)

Metals (lb)	Se	Ni	V	Al	B	Co	Cu	Mn	Sn	Zn
115 MM Rocket (M55), Agent VX, Surface Area = 7.93 sq. ft.										
Metals in Munition Metal (embedded)	NR	NR	NR	10.26	NR	NR	0.54	NR	NR	NR
Metals in Energetic	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Metals in Paint	NR	0.03965	NR	NR	NR	NR	NR	NR	NR	NR
TOTAL (lb, non-embedded)	**NR**	**0.03965**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**
115 MM Rocket Warhead (M56), Agent VX, Surface Area = 2.6 sq. ft.										
Metals in Munition Metal (embedded)	NR	NR	NR	10.26	NR	NR	0.54	NR	NR	NR
Metals in Energetic	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Metals in Paint	NR	0.01322	NR	NR	NR	NR	NR	NR	NR	NR
TOTAL (lb, non-embedded)	**NR**	**0.01322**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**

1. The metals within the munitions metal are considered to be fixed (embedded, inert) and will not vaporize and are therefore not included in the above totals.
2. One third of the M55 Rocket surface area is assumed to be associated with the warhead for the calculation of the warhead surface area.
3. The rocket warhead is constructed of an aluminum casing (95% Al, 5% Cu). The casing is assumed to weigh 10.8 lbs for the above calculations.
4. NR-not reported, no information provided.

TABLE 2-B-2
Metals in Munitions (Other Metals of Interest)

Metals (lb)	Se	Ni	V	Al	B	Co	Cu	Mn	Sn	Zn
Weteye Bomb (MK-116), Agent GB, Surface Area = 28.4 sq. ft.										
Metals in Paint	NR	0.14203	NR	NR	NR	NR	NR	NR	NR	NR
TOTAL (lb, non-embedded)	**NR**	**0.14203**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**

1. The metals within the munitions metal are unknown, not estimated, and considered to be embedded and are not included in the above totals.
2. NR-not reported, no information provided.

TABLE 2-B-2
Metals in Munitions (Other Metals of Interest)

Metals (lb)	Se	Ni	V	Al	B	Co	Cu	Mn	Sn	Zn
Mine (M23), Agent VX, Surface Area = 3.5 sq. ft.										
Metals in Energetic	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Metals in Paint	NR	0.01730	NR	NR	NR	NR	NR	NR	NR	NR
TOTAL (lb, non-embedded)	**NR**	**0.01730**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**
Spray Tank (TMU-28), Agent VX, Surface Area = 91.1 sq. ft.										
Metals in Paint	NR	0.45529	NR	NR	NR	NR	NR	NR	NR	NR
Metals in Ballast	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
TOTAL (lb, non-embedded)	**NR**	**0.45529**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**

1. The metals within the mine and spray tank metal are unknown, not estimated, and considered to be fixed (embedded, inert) and will not vaporize and are therefore not included in the above totals.
2. NR-not reported, no information provided.

Table 2-C-1
ENERGETIC/AGENT NOMINAL WEIGHT
FOR
CHEMICAL AGENT MUNITIONS/BULK CONTAINERS

MUNITION	MODEL / AGENT	DIMENSIONS			AGENT		BURSTER			PROPELLANT		FUSE MODEL	OTHER ENERGETIC COMPONENTS
		DIAMETER	LENGTH (INCHES)	WEIGHT (LBS)	TYPE	WEIGHT (LBS)	MODEL	EXPLOSIVE	WEIGHT (LBS)	MODEL	WEIGHT (LBS)		
105-mm Cartridge	M360	105 mm	31.1	43.86	GB	1.63	M40A	Comp B	1.12	-	-	M508A1	M28B2 Primer
							NA	NA	NA			M557	NA
105-mm Projectile	M360	105 mm	31.1	NA	GB	1.63	--	--	--	--	--	--	--
4.2-inch Mortar	M2	4.2 inch	21.0	24.67	HD	6.0	M14	Tetryl	0.14	-	-	M8	M2 Primer
				24.47	HT	5.8							
155-mm Projectile	M104	155 mm	26.8	98.9	H	11.7	M6	Tetrytol	0.83	--	--	--	0.3 lbs TNT supplemental charge
	M110												
	M121				GB	6.5	--	--	--				
	M121A1				VX	6.3	M71	Comp B	2.45				
					GB	6.5							
	M122				GB	6.5	M37	Tetrytol					
Land Mine	M23	13.5	5	23	VX	10.5	M38	Comp B	0.8	--	--	M603	M120 Booster, M48 initiator, M1 activator
Rocket	M55	115 mm	78.0	57	GB	10.7	M34	Comp B	3.2	M28	19.3	M417	M62 Primer
							M36						
					VX	10.0	M34			M67			
							M36						
525 lb Weteye Bomb	MK-116-0	14	84	525	GB	347	--	--	--	--	--	--	--
Spray Tank	TMU-28/B	22.5	185.5	1,935	VX	1,356	--	--	--	--	--	--	--
Ton Containers	Agent GB	30.1	85.1	2,900	GB	1,500	--	--	--	--	--	--	--
	Agent HD			3,400	HD	1,800							
	Agent VX			3,100	VX	1,500							

NOTES:
NA = Information not available;
HD, and HT = Mustard
RDX = cyclotrimethylenetrinitramine; $N(NO_2)CH_2N(NO_2)CH_2N(NO)_2CH_2$
Comp B (Composition B) = 60% RDX, 39.5% TNT, 0.5% calcium silicate
TNT = 2,4,6-trinitrotoluene; $CH_3C_6H_2(NO_2)_3$
Tetryl = 2,4,6-trinitrophenylmethylnitramine; $(NO_2)_3C_6H_2N(NO_2)CH_3$
Tetrytol = 70% Tetryl, 30% TNT

Table 2-C-2
COMPOSITION OF REACTIVE MATERIAL IN MUNITIONS

MUNITION	COMPONENT			WEIGHT	COMPOSITION
M55 Rocket	1.	Fuze, M417			
		a.	Booster	1.12 grains	RDX[a]
		b.	Pellet Booster	183.5 grains	RDX[a]
		c.	Rotor, Lead	2.77 grains	RDX[a]
	2.	Detonator, M63			
		a.	Upper Charge Primer Mix	0.31 grains	Overall Mixture: 40% Lead Styphnate, 20% Lead Azide, 20% Barium Nitrate, 15% Antimony Sulfide, 5% Tetracene
		b.	Intermediate Charge	2.0 grains	Lead Azide
		c.	Lower Charge	0.99 grains	RDX[a]
	3.	Squib, M2			
		a.	Flash Charge	1.0 grains each(2 required)	Overall Mixture: 32% Lead Thiocyanate, 40% Potassium Chlorate, 18% Charcoal 10% Egyptian Lacquer
		b.	Booster Igniter	46.2 grains(2 required)	Overall Mixture: 49% Magnesium, 49% Potassium Perchlorate, 2% Cellulose Nitrate-Camphor
	4.	Igniter Rocket Motor, M62		385 grains	Overall Mixture: 49% Magnesium, 49% Potassium Perchlorate, 2% Cellulose Nitrate-Camphor
	5.	Propellant Grain, M28		134,750 grains	Overall Mixture:60.0% Nitrocellulose, 23.8% Nitroglycerin, 9.9% Triacetin, 2.6% Diethylphthalate, 2.0% Lead Stearate, 1.7% 2-Nitrodiphenylamine
	6.	Rocket Burster, M34		17,500 grains	Composition B[b]
	7.	Rocket Burster, M36		4,900 grains	Composition B[b]
	8.	Rocket Motor Pellet		3.1 grains	Overall Mixture:49% Magnesium, 49% Potassium Perchlorate, 2% Cellulose Nitrate-Camphor
M23 Land Mine	1.	Fuze, M603			
		a.	Detonator, M45		
			(1)	1.4 grains	Overall Mixture: 53% Potassium Chlorate, 25% Lead Thiocyanate, 17% Antimony Sulfide, 5% Lead Azide
			(2)	3.9 grains	Lead Azide
			(3)	1.9 grains	RDX[a]
	2.	Booster, M120		169.8 grains	RDX[a]
	3.	Burster, M36		5710 grains	Composition B[b]
				47 grains	Tetryl
	4.	Initiator, M48		848.8 grains	Composition B[b]
	5.	Activator, M1		46.3 grains	8% Lead Azide, 87% Tetryl, 5% Igniter Mix
M360	1.	Fuze, M508			
		a.	Detonator (M18)	230 mg	Lead Azide
				340 mg	Tetryl[d]
		b.	Booster Pellet (M125 series)	22 grams	Tetryl[d]
	2.	Detonator, M18			
		a.	Upper Charge	65 mg	Overall Mixture:33.5% Potassium Chlorate, 32.2% Antimony Sulfide, 28.3% Lead Azide, 5.0% Carborundum
		b.	Intermediate Charge	191 mg	Lead Azide
		c.	Lower Charge	80 mg	Tetryl[d]

Table 2-C-2
COMPOSITION OF REACTIVE MATERIAL IN MUNITIONS

MUNITION	COMPONENT			WEIGHT	COMPOSITION
M2A1(4.2-inch mortar)	1.	Fuze, M8			
		a.	M14 Burster Assembly	65.2 grams	Tetryl[d]
	2.	Detonator, M18			
		a.	Upper Charge	50 mg	Overall Mixture: 33.5% Potassium Chlorate, 32.2% Antimony Sulfide, 28.3% Lead Azide, 5.0% Carborundum
		b.	Intermediate Charge	157 mg	Lead Azide
		c.	Lower Charge	70 mg	Tetryl[d]

Notes:
[a] RDX = cyclotrimethylenetrinitramine; $N(NO_2)CH_2N(NO_2)CH_2N(NO)_2CH_2$)
[b] Composition B = 60% RDX, 39.5% TNT, 0.5% calcium silicate
[c] TNT = 2,4,6-trinitrotoluene; $CH_3C_cH_2(NO_2)_3$
[d] Tetryl = 2,4,6-trinitrophenylmethylnitramine; $(NO_2)_3C_6H_2N(N)_2)CH_3$